The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXXIX. September 17, 1938 No. 1,003

The Report of Food Investigation Board

THOSE who heard the Cantor Lecture on "Historical Studies of English Diet and Nutrition" delivered last winter by Professor J. C. Drummond before the Royal Society of Arts will still have a lively sense of the appalling conditions under which our ancestors lived in respect to their food supply and, in the light of present-day knowledge, a feeling of incredulity that the human race has survived. A deal of unsuitable food has always been consumed, but in the early part of the industrial period, a hundred and two hundred years ago, every sort of food adulteration was practised. A pamphlet published in 1757 draws a grim picture of the terrible suffering caused thereby and Accum's treatise published in 1820 and translated into many languages awakened people to the extent of the evil. Even when criminal adulteration was stopped, the commercialisation of the food industry grew at a greater rate than the spread of knowledge regarding the composition and nutritive value of foods and the conditions necessary for transport and storage. Flour frequently was stored till it became rancid before use; there was a considerable trade in "reconditioning" butter by melting, adding soda, and incorporating enough tallow to give the final product a firmer consistency; milk was just a breeding-ground for germs, and so on. The toll of disease and death was terrible, but the fittest survived and in spite of the conditions the population multiplied exceedingly. Perhaps many achieved a certain immunity that we do not possess in these days.

It is a strange mental experience to turn directly from this picture through a few decades to the present day as depicted in the Report of the Food Investigation Board for the year 1937 that has just been published. The properties and composition of every food of importance are under precise investigation; the quality of these foods are now the subject of precise chemical tests; the conveyance and storage of food have become a branch of chemical engineering in which due regard is paid to the precise control of temperature and atmosphere. As a result, the standard of our staple foods has improved enormously, and the range of foods available in any country comprises everything grown in the world which is conveyed thousands of miles and kept in prime condition until it reaches the consumer. A serious case of food poisoning is to-day headline news in the daily papers, and that is perhaps the greatest compliment that can be paid to those who are working on food investigation.

It would be impossible to attempt any summary here of this report of 266 pages, but the general chemical reader will be impressed by the wide scope of the work. The Report of the Director is divided into eight sections dealing with meat, poultry and eggs, pig products, fish, fruit, vegetables, canning and engineering. Members of the staff have visited distant parts of the world to confer with workers in those countries, and it is evident that international co-operation in its happiest form prevails in this branch of work. The Board records its impression following one such visit to the U.S.A. that "while this country is in no way behindhand in research on the handling and storage of foodstuffs, the application of science in this field is not so forward here as in the U.S.A." Obviously, there must always be a time-gap between research and application, but manufacturers in this country generally—and not by any means only in the food industry—are slower in applying new ideas than are many of their foreign colleagues or competitors.

The Medical Research Council has been consulted by the Board in respect to the fundamental problem as to whether food that has been stored by modern methods, such as cold storage, gas-storage and canning, is as nutritious as fresh food. The answer returned was that the question could not be answered categorically but that the available evidence suggests that modern methods of storing food cause little deterioration in their nutritive value.

An important discovery is that fish cannot be adequately preserved in ice for more than about 10 days, but that it can be stored for six months up to two years at − 20° C. or, better, − 30° C. The Board add that they "are glad to learn that the industry is now seriously considering the commercial possibilities of brine-freezing and cold storage." It appears the development of a quick and reliable chemical test for freshness in fish, that can be applied equally well whether the fish is wet or frozen, is expected.

All these precautions in all branches of the food industry to get the food to the consumer in the best possible form are of the utmost value and the human race is reaping a rich harvest.

In general the Englishman eats the things he likes and afterwards it gives him a certain amount of pleasure to hear that they "do him good." His apathy with regard to new discoveries in dietetics has one advantage—it prevents him from being easily impressed by the exaggerated emphasis sometimes laid on them in advertising.

—*A. W. Knapp.*

Notes and Comments

Annual Report of the Inspectors of Explosives

THE total number of accidents due to explosives in 1937 rose to 397, as against 317, according to the annual report of the Inspector of Explosives. The number of accidents in manufacture also rose from 73 to 112, a figure well above the average of 57.7 for the ten years 1928-1937. This increase is put down in the report to the general activity of the industry and is partially accounted for by a greater number of fires during the rolling of certain types of propellants. Thirty accidents were reported in the use of petroleum for cleaning and the inspectors comment on the high accident rate for the amount used compared with the 41 accidents only occurring in the conveyance, storage and use of 5 million tons of petrol. Manufacture of explosive compositions by amateurs were again a source of serious accidents. As we pointed out (THE CHEMICAL AGE, 1937, *37*, 167) in connection with the previous report, the sale of chemical sets to the young is a direct incentive to meddle with chemicals to produce the most spectacular results possible. It is surely high time that the sale of these sets, even if their contents are comparatively innocuous, was prohibited to those below the age of eighteen. Accidents in industry, however, can give little cause for complaint. Their number remains surprisingly small in view of the large quantities of explosives manufactured and used.

Business in the French Fertiliser Industry

CONSIDERABLE improvement in the business of the French fertiliser industry is reported. Sales of potash fertilisers amounted to 597,000 tons, which is 20 per cent. more than last year, and it was the same amount as was sold during 1929, the best year on record. Nitrogen fertilisers showed an improvement of 10 per cent. over last year, sales amounting to 430,000 tons, the highest figure yet reached in France. The improvement is due almost entirely to an increase in the French internal consumption, which accounts for 58 per cent. of the sales. French potash mines have consequently been doing excellent business, their production amounting to 279,000 tons, or 55,000 tons more than last year. In spite of this situation, however, producers are not entirely satisfied. They point out that the price of potash has not increased in proportion to the increase in production costs, so that the profit left by the increased sales is very small. The situation of nitrogen fertiliser manufacturers is a little better, some increases in price having been allowed by the price pegging commissions. As regards superphosphates, the manufacturers report a slowing down of activity, sales having amounted to only about a million tons, 16 per cent. less than last year.

Special Bibliographies

RESEARCH departments of manufacturing organisations constantly find it necessary to refer to the scientific literature in order to gain an accurate knowledge of the work which has already been done in the particular branch of the subject upon which they are engaged. In this way a great deal of superfluous effort may be avoided and in some cases a complete repetition of a previous research. Most research departments, therefore, contain a reference library of a size depending largely upon the type of work under investigation. If the work is mainly concerned with one specialised subject and problems closely related to it then a small library can be built up containing the great majority of the information required. But where work is of a more general nature a large library is required if it is to be satisfactory in service. A large library not only takes a long time and much money to collect but its maintenance costs are considerable, including those of a library staff. The Central Agricultural and Scientific Bibliography (C.A.S.B.) in compiling bibliographies on special subjects thus answers an industrial demand. C.A.S.B. operates from the Science Library and the preparation of the bibliographies are in the hands of those who have expert knowledge of the work. A list of bibliographies specially prepared or issued to its subscribers by C.A.S.B. during the period March, 1936, to September, 1938, has just been issued. It comprises two sections: agriculture and allied industries, and industrial chemistry and physics, the latter section containing over thirty bibliographies on such subjects as the manufacture of starch, acid-proof cements, ammonia synthesis, the production of benzine from water gas, and industrial alcohol from agricultural products. With the increasing flood of scientific literature useful bibliographies such as those supplied by C.A.S.B. are a great help to the research worker.

Chemical Engineering and Craftsmanship

ONE rarely comes across a manufactured product the quality of which is not liable to be improved by the application of modern scientific methods in its production. But Dr. R. Gilmour in his paper read before a joint meeting of the Institution of Chemical Engineers with the Society of Chemical Industry during the Society's autumn meeting in Glasgow showed that the efficiency of the process of certain industries, such as the manufacture of whisky, could be improved by the use of the latest developments of chemistry and chemical engineering, but if this use were indiscriminate the results might be disastrous to the quality of the product. For example, grain whisky after distillation in a Coffey still, is not wholly free from by-products. This certain amount of body is advantageous and would be largely removed by the use of modern rectifying columns. Again, the drying of the malt by modern methods instead of in a peat- or anthracite-fired kiln, and the use of pure yeast cultures and sterile working conditions would destroy the products' individual characteristics.

The Building Exhibition

THE Building Exhibition which opened yesterday at Olympia is again on a big scale with the ground floor of both the Grand and National Halls, as well as the whole of the gallery of the Grand Hall, being devoted to the exhibits. There are 400 firms showing builders' materials and plant and many of the stands are constructed of the materials which the firm wishes to exhibit. Paints figure prominently in builders' materials and also specialised products such as petrifying liquid for brick and concrete and sealing compound for treating porous materials before painting. Synthetic resins also find an extended application in the manufacture of fitments. The exhibits on the stand of the D.S.I.R. represent some of the more important current investigations in the laboratories of the Building Research Station, the Forest Products Research Laboratory, the National Physical Laboratory, the British Non-Ferrous Metals Research Association, and the Paint Research Station. The exhibition will remain open until October 1.

Gas Reactions Applied in the Textile Industry

By
J. WAKELIN

IN many respects textile manufacture and processing is in a class by itself. It has its own technology, methods, modes of operation, and, of course, it inevitably gives rise to its own peculiar species of technical difficulties. Up to the present time, the chemical processes carried on in that industry have almost always been conducted in aqueous media, or in the presence of water in the liquid state. Textile fibres are all solid and the application of treating chemicals in liquid form is the most natural and obvious way of effecting changes in their properties.

A New Technique

The purpose of this account is to illustrate certain new processes which call for the treatment of a textile fibrous material with a chemical substance in gaseous form. It is not suggested that liquid applications will be superseded by vapours but a new technique may be called into being and the necessity for gaseous processes may influence a number of aspects of machinery design and technical practice. At least, this trend deserves the consideration of chemists and technicians, textile and otherwise. A few of the inventions to be described contain some novel element which is a departure from the customary, traditional idea of textile processing.

Chlorine is aged in wool processing as a reagent for rendering it unshrinkable and unfeltable. Chlorination is not a new idea for it has been used for many years, but frequently without outstanding success. The usual practice is to immerse woollen material in an aqueous solution of alkali hypochlorites, acid being then added to decompose and to liberate chlorine in an active form. As carried out in the liquid phase, some difficulty is encountered to avoid uneven results which usually means that the fibre is over-attacked in places, and hence a certain amount of movement of the reagent or the material is called for. Even at the best, the decomposition of the hypochlorite is too spasmodic and absolutely uniform chlorination is almost a practical impossibility.

Alternative to Wet Chlorination

As an alternative to wet chlorination, the Wool Industries Research Association have evolved a method of treating wool with chlorine gas which yields an evenly chlorinated fibre, capable of being dyed evenly, and unshrinkable. Wool in the form of " tops " wound on perforated spindles is placed in a cylindrical chamber to which is supplied a controlled and measured quantity of gaseous chlorine. The first chamber proposed has been improved since by the introduction of means whereby the gas is kept in movement to avoid segregation due to gravity with consequent uneven treatment (B.P. 475,719).

For obtaining uniformity of action of a chemical substance on a textile fibrous material, it is essential that there should be some degree of mixing movement, especially if the reaction is a comparatively rapid one. The drawback to the wet chlorination process was that the chlorine liberation tended to be most prolific in the early stages when the reactive power was also most intense. Some regions of the material consequently received more than their due and others came out of the process almost unchanged. When the reactant is a gas the natural molecular movement of the individual molecules no doubt provides a better degree of intermixing. Evidently, however, even molecular movement is not sufficient, for, as we have seen, wool chlorination demands a moving gas stream.

Another and somewhat novel mode of gas "movement" is referred to in British Patent 464,823 to Aceta Ges., of Lichtenberg, Berlin, namely, rhythmic alterations of pressure. They propose to subject wool yarn to propylene gas mixed with air of 75 per cent. relative humidity for a period of eight hours at 50° C. A change of pressure equal to 40 mm. water column takes place 90 times per minute. Very little general information about this very suggestive mode of gas-treating is available from the specification and one is left to speculate what effect this oscillating pressure has in this particular instance, or in any other. Sometimes a simple innovation of a commonplace principle has very far-reaching consequences. The effect of so treating wool with propylene oxide is to increase its affinity for many acid dyestuffs and to make it less susceptible to insect infestation.

Wool may be chlorinated with sulphuryl chloride instead of hypochlorites or chlorine, according to A. J. Hall and his co-workers. The method originally proposed was to immerse the goods for one hour at room temperature in a 2 per cent. solution of sulphuryl chloride dissolved in white spirit. After washing and neutralising the wool, it is stated to be unshrinkable.

The analogous process to this carried out in the gaseous phase is found in British patent 483,707 to the same inventors. In it, wool is subjected to chlorine and sulphur dioxide either together or separately in succession. Wool containing 7 per cent. moisture is treated in a chamber with equal volumes of those gases for 15 minutes. After that, dry air is circulated to remove the gases and the treated wool is washed and dried.

Gaseous Formaldehyde in Cotton Finishing

The disadvantageous creasing propensity of the cotton fibre has given rise to an enormous outpupt of research work in recent years and there is little sign of declining interest. The knowledge that urea-formaldehyde resins reduce this creasibility was demonstrated a few years ago and since then every conceivable mode of applying these bodies to cotton seems to have been tried, to judge from the patent literature.

The impregnation of cotton with a mixture of urea, formaldehyde and an acid catalyst, which is the formal routine, has many drawbacks. The mixture tends to condense prematurely, there is a danger of the acid tendering the cloth, and so on.

The I. G. Farbenindustrie A.-G. propose to apply the urea (or other basic ingredient) and the formaldehyde separately, the latter in the form of a vapour. In consequence, they report that the above drawbacks are eliminated and that an economy in the use of chemicals is effected. No acid condensing catalyst is necessary, which means that tendering of the cloth is less likely. Viscose rayon or cotton, for example, is first impregnated in a 1 per cent. bath of urea for 30 minutes at 80° C.

After being wrung and dried, the rayon is then heated to 120° in the vapour of paraformaldehyde for two hours. So treated, the material becomes resistant to creasing and there is no fibre damage (B.P. 454,868). There are other patented methods involving the use of formaldehyde in the vapour form.

Ethylene Oxide in Finishing

Cellulose reacts with ethylene oxide to form alkali-soluble glycol ether and upon this fact is based a method of producing pattern or lace effects on cotton (B.P. 475,906). For instance, cotton velveteen is printed with an alkaline, thickened paste and still undried is suspended in a closed chamber of about 6 cu. ft. capacity containing 153 grams of ethylene oxide. After 18 hours at ordinary temperature, during which the gas is circulated by a fan, the cotton is removed and

immersed in cold aqueous 5 per cent. caustic soda and moved about therein. Those areas which received the paste in the first place and which then reacted with the ethylene oxide to form cellulose ether, are now dissolved and removed. Where, however, there was no alkaline paste, no soluble ether was formed and the cotton there did not react with the ethyllene oxide. The effect is equivalent to etching. Finally, the cloth is washed in water, soured off with sulphuric acid, washed again and dried. Lace-like finishes are obtainable by this method.

A Note on the Bleaching of Lac

By

B. S. GIDVANI, D.I.C., Ph.D., A.I.C.

ALKALI lac solutions are ordinarily bleached with hypochlorite solution, added in small quantities at a time. It is well known that bleached lac "blocks" and loses its solubility in alcohol on storage, while varnishes prepared from such bleached lacs darken in colour on storage; films from such varnishes are non-drying. Venugopalan[1] has suggested that residual traces of the mineral acid used in precipitating the bleached lac are responsible for this discoloration, by accelerating the esterification of the lac in alcoholic solution.

Blocking of Bleached Lac

It has now been found that the blocking of bleached lac is not only due to these slight traces of mineral acid, but also to its chlorine and high moisture content. Bleached lac until recently was generally marketed in the form of hanks having a moisture content of 15-20 per cent.

Watson and Mulany[2] treated the bleached lac with a 10 per cent. sodium thiosulphate solution in order to remove any free chlorine. This method was not generally adopted, for though it removes the free chlorine adhering to the surface of the granular precipitate, it does not eliminate the chlorine occluded within the granules. Further, the use of thiosulphate may introduce free sulphur into the lac and thus modify its properties.

Recently Venkatasubban[3] has recommended wet grinding of the bleached lac in a "Kek" mill in order to remove the mineral acid and chlorine. Though this method effectively removes the free chlorine and mineral acid, it will not prevent the bleached lac from blocking if its moisture content is high. Samples of bleached lac known to be free from free chlorine and mineral acids "block" on storage. This effect can be explained if it is assumed that the water present in the bleached lac hanks in contact with the chemically combined chlorine of the lac molecule[4] produces hydrochloric acid, well known for its polymerising and blocking effect on lac.

Precautions in Treatment

Blocking and insolubility of bleached lac can be overcome by taking the following precautions:—

(1) When bleaching with hypochlorite is complete, a little hydrogen peroxide is added to remove the excess of unreacted chlorine, while the lac is precipitated at room temperature by slowly adding 10 per cent. sulphuric acid with constant stirring. By this method, bleached lac is precipitated in fine granular form.

(2) The bleached lac is then either centrifuged or filtered and thoroughly washed with cold water until there is no mineral acid left in the washings.

(3) The wet bleached lac is then vacuum dried to produce "bone-dry" bleached lac, containing less than 2.5 per cent. moisture. It is not absolutely necessary to dry the bleached lac under vacuum. A warm draught of air (30-35° C.) can be used, so long as the moisture content is ultimately reduced to less than 2.5 per cent.

Bleached lac produced in this manner can be stored indefinitely. Samples have been prepared in these laboratories to produce hanks by the standard bleaching and washing methods and also to make fine granules by the method described; it has been found that whereas the hanks have blocked and lost solubility in alcohol after 3-4 months' storage, the granular types have retained complete solubility, even after storage of 15 months.

Overbleaching is known to be detrimental to the storage and solubility of white lacs. It has now been found that if the above-mentioned precautions are taken and white lac is precipitated in fine granules and is completely freed from mineral acid and dried, overbleaching has no effect whatsoever on its storage properties. Samples of white lacs giving water-white alcoholic solutions, prepared a year ago, are still completely soluble in alcohol.

Increase in the acidity of lac is also associated with the bleaching. It has now been found that if the bleached lac is prepared as described above, no increase in the acid value is observed. The increased acidity of the bleached lac may, therefore, be assumed to be due to slight traces of the mineral acid used for precipitation, and the water-soluble lac acids produced during the slight hydrolysis of lac which takes place during the bleaching process. Efficient washing evidently removes both these causes, for a control specimen of Dewaxed Lemon Shellac gave an acid value of 67.00, while the overbleached lac from the same type of lac gave 67.45.

Lac Research Laboratory,
Chemical Engineering Department,
University College,
Gower Street,
*London, W.C.*1.

September, 1938.

References

(1) Venugopalan, *J. Indian Inst. Sci.*, 1928, *11a*, 17.
(2) Watson & Mulany, *J. Indian Chem. Soc.*, 1926, *3*, 255.
(3) Venkatasubban, *J. Soc. Chem. Ind.*, 1938, *57*, 288 T.
(4) Gidvani & Bhattacharya, "Iodine Values of Shellac — Reaction of Halogens on Shellac" (to be published shortly).

Sulphur Pipe Construction

Good Corrosion Characteristics

THE use of sulphur as a material for pipe construction is reported in *Canadian Chemistry and Process Industries,* 1938, *22,* 330. This new development has been commenced at the Texas Gulf Sulphur Co., and the technique employed is that used for the fabrication of metal pipes by spinning. The mould is rotated at high speed, so that the molten material run in is carried to the inner walls of the mould by centrifugal force. A small amount of molten sulphur is first run into the mould, and spun till cool, so as to form a skin. This skin is dusted over with coke dust, and then a mixture of molten sulphur and aggregate, which latter may be asbestos, coke, sand or gravel, is run in and the mould spun until the mass is compacted and cooled. To eject the completed pipe, the mould is steam heated on the outside, which melts the skin first formed, and enables the pipe to slip out easily. The pipe has all the corrosion and acid resisting characteristics of pure sulphur. The sulphur content varies from 35 to 83 per cent., the majority of the remaining constituents being asbestos.

Hydrogenation Cracking of Tars

Production of Aromatic Hydrocarbons from Phenols

FOLLOWING the publication of three sectional reports upon the subject of "Hydrogenation Cracking of Tars," the Department of Scientific and Industrial Research has now issued a fourth part relating to "The Production of Aromatic Hydrocarbons from Phenols at Atmospheric Pressure." (Fuel Research Technical Paper No. 48, Stationery Office, 1s. 3d. net).

The production of low-boiling hydrocarbons from tars and tar oils by the hydrogenation-cracking process is carried out by treating the tar with hydrogen under high pressure and at elevated temperatures, the conditions commonly employed being a pressure of about 200 atmospheres and a temperature of 400° to 500° C. Parts I-III of this series of reports dealt with this aspect of the hydrogenation of tars.

Manganese as Catalyst

The present report describes experiments on the conversion of a portion of these tars—the tar acids—to aromatic hydrocarbons by treatment with hydrogen at atmospheric pressure. It is now well known that molybdenum in the form of the oxide is an active catalyst for the de-oxygenation of phenols, but at the time when this investigation was begun, the effect of catalysts on this reaction had received little attention, although a considerable amount of work had been carried out on the high-temperature decomposition of phenols in the absence of a catalyst, some of the investigators claiming to have obtained a good yield of aromatic hydrocarbons from phenols.

In the early experiments, described in Section 2, the conversion was attempted solely by the use of high temperatures, but good yields of aromatic hydrocarbons could not be obtained. At 750° C., the maximum yield of hydrocarbons from the cresols was 30 to 40 per cent. of the weight of the substance treated. A considerable amount of cracking to carbon and gas occurred. In view of the formation of large amounts of gas at the high temperature necessary to effect reduction of the phenols, the use of catalysts to bring about the reduction at a lower temperature was investigated and the results are described in Section 3.

Molybdenum oxide supported on active charcoal was found to be the most active catalyst. The effect of temperature, rate of feed of the phenol, and the amount of hydrogen in relation to the phenol was studied. At a reaction temperature of 450° C. and a throughput of cresol of 0.2 ml. per ml. of catalyst space per hour, the yield of toluene was 70 per cent. by weight of the cresol treated.

Accompanying the main reaction was the formation of a small amount of polymerisation products which were deposited on the catalyst, thereby lowering its activity. It was found that the activity of the catalyst was maintained for a longer time if a large excess of hydrogen was used. Attempts to reactivate the "spent" catalyst by heating in air and steam were unsuccessful, since conditions drastic enough to remove the deposit also oxidised the support. Various porous inorganic materials for supporting the molybdenum oxide were therefore tried, and the supported catalysts were found to vary considerably in activity. Bauxite impregnated with molybdenum oxide gave the best results and was only slightly inferior to active charcoal impregnated with molybdenum oxide. The bauxite-supported catalyst possessed the additional advantage that, after deterioration, it could be restored to its original activity by oxidation in air at a temperature of 500° C.

The basis of a continuous plant was thus indicated and the results obtained justified their confirmation on a larger scale. The design and operation of a small-scale plant capable of treating 2 litres of material per hour is described in Section 4 of the report.

Semi-Scale Plant

This plant, which is shown in the accompanying illustrations, consisted of two mild steel converters (A and A_1) 4 ft. long and 5 in. diameter, heated by flue gas. The hot gases were admitted through a lagged pipe 2 in. diameter (B and B_1) into the annular space between the converter and the outer lagged jacket (C and C_1) which was a mild steel cylinder 4 ft. long and 7 in. diameter. Each converter was provided with a spiral which fitted into the annulus and caused the heating gases to circulate round the converter. The waste gases were withdrawn at three points: (1) 1 ft. 3 in., (2) 2 ft. 3 in., and (3) 3 ft. 9 in. from the top of the converter. The amounts admitted and withdrawn at each point were controlled by a cock, and either one-third, two-thirds or the whole of the converter could be heated as required.

Each converter was filled with 15 kg. of the catalyst

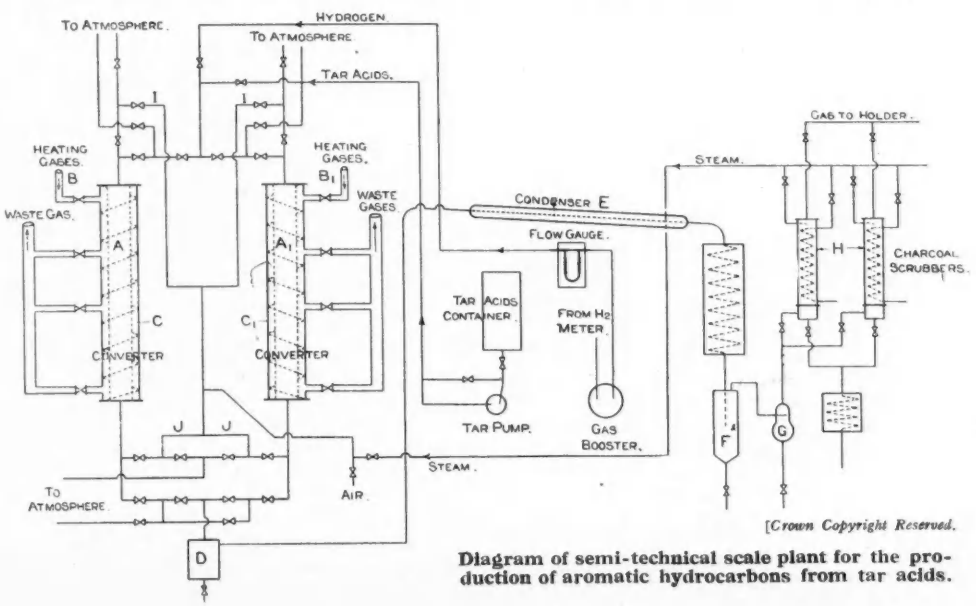


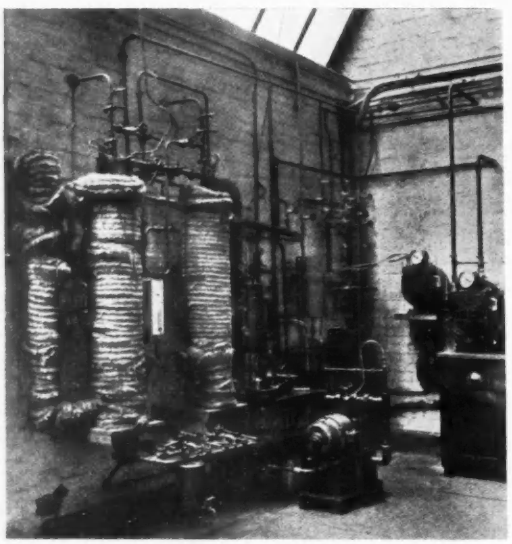
Diagram of semi-technical scale plant for the production of aromatic hydrocarbons from tar acids.

consisting of molybdenum oxide supported on bauxite. The dry impregnated bauxite contained 14 per cent. by weight of molybdenum trioxide.

The phenols and hydrogen were pumped in at the top and passed through the catalyst, and the products were taken off at the bottom of the converter. They passed into a receiver (D), and then through a water-cooled condenser (E) to a second receiver (F), where the main portion of the product collected. The vapours travelled to a fog-separator (G) and a charcoal scrubber (H) in which the remaining spirit was removed. The residual hydrogen was collected in a holder, from which it was recirculated through the plant. The spirit was recovered from the charcoal by steaming, the vapours meanwhile being passed through a second charcoal scrubber.

Temperatures were recorded by thermocouples at four positions :—(1) 8 in., (2) 1 ft. 4 in., (3) 2 ft., and (4) 3 ft. from the top of the converter. An exploration of the temperature from the top to the bottom of the converter during an experiment with a throughput of raw material of 2 litres per hour showed that the top section (12 in.) was at a much lower temperature than the remainder of the converter. The volume of the converter at reaction temperature was approximately 9 litres.

Before the start of an experiment in the laboratory the catalyst was heated in hydrogen at 450° C; the ammonium molybdate was thus converted to molybdenum dioxide. It



View of plant for the production of aromatic hydrocarbons from tar acids.

was found, however, that there was no disadvantage in starting with molybdenum trioxide, and this procedure was adopted in the semi-technical-scale plant.

The deterioration of the catalyst during an experiment was followed by taking a snap sample of the product at intervals and determining its phenol content. When the catalyst in one converter had deteriorated in activity, the phenols and hydrogen were passed through the other converter. Meanwhile the spent catalyst was reactivated by oxidation. At the beginning of a run, the amount of phenols in the product was about 4 per cent., but this amount increased as the catalyst gradually lost its activity until a point was reached at which it became unprofitable to work the process. This point was fixed arbitrarily at about 40 per cent. of phenols in the product.

The materials treated were as follows :—(1) "Pale cresylic acid," consisting largely of the cresols and 97 per cent. boiled between 190° and 198° C. when distilled from a flask fitted with an eight-pear column. (2) "Cresylic acid," containing only a small proportion (approximately 30 per cent.), of cresols, the remainder being xylenols. (3) Tar oils, the fractions treated being made from low-temperature tar prepared in Fuel Research Station narrow brick retorts and including (a) oil distilling up to 230° C., 18 per cent. by volume of the tar; (b) oil distilling between 230° and 270° C., 11.3 per cent. by volume of the tar; (c) oil distilling between 270° and 310° C., 8.0 per cent. by volume of the tar; (d) oil distilling between 310° and pitch (twist point 55° C.), 13.3 per cent. by volume of the tar.

In the case of pale cresylic acid at a low throughput (0.6 litres per hour), the oil product collected over 24 hours amounted to 80.3 per cent. by weight of the cresylic acid treated and contained 91.0 per cent. of neutral oil and 9.0 per cent. of phenols. It will be seen that during the first four hours of the experiment complete conversion to neutral oil was obtained, but after the fourth hour the product contained phenols and the amount increased as the experiment proceeded. At the end of 24 hours the product contained 76 per cent. of neutral oil. The total yield of neutral oil was 73 per cent. by weight of the raw material treated.

Deterioration of Catalyst

With a throughput of 2.0 litres per hour of cresylic acid the rate of deterioration of the catalyst was very much greater than with the throughput of 0.6 litres per hour. At the end of one hour the product contained 96 per cent. of neutral oil, at the end of three hours 76 per cent., and at the end of five hours 60 per cent. of neutral oil. At this point the experiment was stopped and the total product collected over five hours contained 71.4 per cent. of neutral oil and 29.6 per cent. of phenols, or calculated on the basis of the cresylic acid treated, 60 per cent. of neutral oil and 24 per cent. of phenols. With a throughput of 3.0 litres per hour, the experiment was discontinued at the end of four hours, the product at this stage containing only 58 per cent. of neutral oil. The total yield of neutral oil obtained over four hours amounted to 53 per cent. by weight of the cresylic acid used.

Considerable difficulty was experienced in the early experiments in revivifying the catalyst owing to the large amount of heat evolved by the burning of the carbon and other material deposited on the catalyst and by the re-oxidation of the lower oxide of molybdenum to molybdenum trioxide. It is necessary to maintain the temperature of the catalyst below 550° C., since above this temperature volatilisation of molybdenum trioxide takes place. Various methods of reactivation were tried. In the first, a large excess of steam was used to dilute the air and the amount of heating gases supplied to the converter was decreased. As the zone of active combustion travelled down the converter, the temperature of the upper part of the catalyst fell considerably owing to the large amount of steam being used and the complete revivification of this part of the catalyst could not be completed until the temperature was raised by external heat.

Treatment of Cresylic Acid

In the treatment of cresylic acid a continuous process run lasting four days was carried out by using the two catalyst chambers for five hours alternately and simultaneously revivifying for four hours the spent catalyst in the chamber not in use. The material used was a cresylic acid containing a low percentage of cresols, the remainder being xylenols. The throughputs of cresylic acid and hydrogen were 2 litres per hour and 4,500 litres per hour respectively. The oil product amounted to 84 per cent. by weight of the material treated and contained 67 per cent. of neutral oil and 33 per cent. of phenols. The fractionation of the neutral oil showed that the yield of the fraction 100° to 130° C., consisting mainly of toluene, amounted to 27 per cent. by weight of the neutral oil, corresponding to about 60 per cent. by weight of the cresols in the cresylic acid treated.

The conversion of tar acids to neutral oil varied from 62 per cent. to 77 per cent., and was greatest with the fraction distilling up to 230° C. and least with the fraction distilling up to 360° C.

Chemical Engineering in the Fermentation and Distilling Industries*

By
R. GILMOUR, B.Sc., Ph.D.

ORIGINALLY, Scotch whisky was a product made entirely from home-grown malted barley. In essentials, the process consists of five stages: (1) Preparation of malt from barley. (2) Mashing of the malt, whereby the starch is converted to sugar. (3) Fermentation of the sugar solution. (4) Distillation of the alcoholic wash to separate whisky. (5) Maturing of the whisky.

The preparation of malt involves several stages. The barley, after screening to remove broken corns and foreign matter, is transferred to tanks called steeps. These are usually cylindrical vessels with a conical bottom, and provided with a perforated pipe for aeration of the steep. In the steeps, the barley is covered with water at 50-54° F. and allowed to remain for 48-60 hr. with occasional aeration.

The Malting Process

The steeped barley, containing about 45 per cent. of water, is then transferred to the malting floors, where it is spread out to a depth of 12-15 in. After a few days, germination begins and the temperature rises. Occasionally the "piece" (as it is termed) is turned over with wooden shovels or forks to aerate the growing grain and keep the temperature down to 63-65° F. An occasional sprinkling with water is also necessary to make up for the loss due to evaporation.

Large grain distilleries in the early days also used the floor system of malting, but this was gradually displaced by the pneumatic or drum system, which though more costly to install, had the advantage of requiring less labour and occupied much less floor space. In this system the steeped barley is germinated in large horizontal drums which rotate about once in every ¾ hr.

Other mechanical systems are in use and one much favoured in the U.S.A. and to some extent in this country is the Saladin system. This consists of shallow rectangular boxes with a perforated false bottom, and fitted with travelling rakes for turning over the barley. Complete air-conditioning systems are sometimes fitted and air of the required temperature and humidity is drawn downwards through the grain.

At the conclusion of the germinating period, sprinkling is stopped on the floors or in the mechanical system a stream of dry air is drawn through the system. This is known as the withering stage and it results in a drop in the moisture content of the grain, withering of the rootlets and stoppage of germination.

Mashing and Cooling the Wort

The resulting product is known as "green malt" and in some instances it is used directly in this form in the mashes, after being roughly crushed. But, in general, this applies only to yeast factories; for whisky the green malt is dried in kilns. In most grain and Lowland malt distilleries, anthracite is the fuel used, but in Highland malt distilleries peat is used. Alternative methods of drying are sometimes adopted, such as the use of a drying drum through which hot air is passed. Vacuum drying is also used and it is claimed that this is the best system.

The efficiency of the mashing process in the very early days must have been very low, as the proper conditions of temperature for the action of the diastase must have been difficult of attainment.

In more modern days the commercial distillery employs a cast-iron mash turn with an elaborate arrangement of rotating rakes and a perforated false bottom through which the wort is drained.

The cooling of the wort takes place in long rectangular sloping troughs, from side to side of which banks of square-sectioned tubes pass. Each bank of tubes forms a partition and these partitions are staggered so that the wort passes under one and over the next and so on. These coolers have the advantage that the surfaces exposed to the wort are easily cleaned, and though not so efficient as modern tubular coolers, they have been standard in distilleries for many years.

In modern malt distilleries on the commercial scale, the fermenters, or wash-backs, as they are called, are wooden-stave circular vessels held together by driving hoops. Usually they have a wooden cover with a rectangular sliding hatch at one side. The fermentation is carried out by the addition of brewers' yeast and lasts 60-70 hr. At the conclusion of the fermentation the wash is run to large wooden storage vessels known as wash chargers from which the charges for the stills are drawn.

The separation of the alcohol from the fermented wash is the final stage in the manufacture of whisky—apart from maturing—and for malt whisky, the stills used at the present time hardly differ from the earliest known stills, except in size. They represent the simplest type of still, viz., a discontinuous pot still without rectification.

The separate stills are used, a wash still which serves to remove all the alcohol from the wash and recover it as weak spirit or low wines, and a low-wines still which serves to separate the low wines into foreshots or heads, middle runnings or finished whisky and feints or tails.

Fire-Heated Stills

In general, the stills conform to a standard shape, viz., a flattened sphere with an inverted dished bottom and a tall tapering vapour pipe leading to a worm cooler. They are almost without exception fire-heated, though sometimes a steam-jacketed wash still has been used.

Wash stills are usually fitted with stirring gear in the shape of a rotating central shaft with chains which scour the bottom of the still and prevent incrustation or burning of organic matter due to the fire heating.

The finished whisky is stored in oak casks for maturing. The various changes which go on during maturing are rather a matter of conjecture. Certain fusel oils and esters remain unchanged and acids appear to be formed. Oxidation changes no doubt take place by breathing through the wood and a certain loss of alcohol is a regular feature of maturing due to preferential evaporation through the wood.

The fact remains that the whisky definitely improves greatly with age, and acquires a mild and mellow flavour quite different from the raw product. It is generally accepted that this improvement continues for 12-15 years, after which there is a risk of deterioration.

In the manufacture of grain whisky the methods of mashing and fermentation are similar to those for malt whisky, but a large proportion of unmalted grain is used in addition to the malt, and the latter is dried on anthracite-fired kilns or in hot-air operated drying drums.

The distillation is carried out continuously in patent or Coffey stills, which produce a strong whisky of 90 per cent. strength.

The whisky produced is practically free from by-products such as fusel oils and esters, but not wholly so, and for the purpose of blending with malt whisky it is desirable that the spirit should not be absolutely pure and characterless.

*From a paper read at a Joint Meeting of the Institution of Chemical Engineers with the Society of Chemical Industry held at the Royal Technical College, Glasgow, on September 16.

The manufacture of gin is a comparatively simple process of distilling very pure grain spirit over various flavouring matters including, among others, Juniper berries and coriander seed. The distillation is carried out in pot stills and every distiller has his own formulæ and his own ideas regarding the standards to which the spirit used must conform.

In this branch of the potable spirit trade, as in whisky manufacture, traditional methods of operation, sizes and shapes of stills and so on, are important.

Comparatively Modern Developments

The industrial alcohol industry is a comparatively modern development. In the early years of the 19th century, many attempts were made to devise a continuous system of distillation, and the first important still of this nature was that invented by Robert Stein in 1827.

In this still a process of partial condensation of the alcoholic vapours was applied. The cold wash was first heated by the spirit vapour entering the worm and then by the vapours leaving the head of the still, and, finally, by the spent wash leaving the base of the still column. The wash then entered the column and was stripped of alcohol by the steam blown in. The use of hair-cloth diaphragms, through which the vapours passed, doubtless had a certain rectifying effect. At a later date a rectifying column was incorporated, and spirit up to 88-90 per cent. strength was obtained.

Stein's still was followed in 1830 by Coffey's still, or the patent still as it is often called. This is so well known that detailed description is unnecessary. The novel feature of this still was the use of the cold wash, to provide a partial condensation of the alcoholic vapours in a column corresponding to the rectifier in modern stills. This was accomplished by carrying the wash pipe backwards and forwards across the columns all the way down; the wash was thus preheated and the rising alcoholic vapours were subjected to partial condensation. The scheme is apparently somewhat similar to Stein's.

The still has its limitations. Like all perforated-plate columns, it must not be run below a certain minimum load, otherwise the plates empty. It also has the disadvantage that, for the production of very high strength alcohol, the wash does not provide sufficient reflux unless it is very low in alcoholic content.

Although eminently suitable for whisky blending, the Coffey has gradually been abandoned for industrial alcohol in favour of the modern stills with circular column and bubbler caps, which can handle effectively high strength molasses wash and produce a pure neutral spirit.

Choice of Two Types of Column

The bubbler cap type of column is much more extensively used nowadays than the perforated plate type, but when constancy of feed can be assured the latter has some points in its favour; for example, it allows a somewhat higher vapour velocity through the cross section of the column and consequently a column of smaller diameter than the bubbler cap type is capable of the same output. This is a matter of some importance when large columns are under consideration, as it means lower capital expenditure.

Recently, there has appeared on the market—and a few of them are in use—a perforated plate type of column in which the plates are sealed so that they cannot drain. This is known as the West column. In principle, it consists of a series of troughs with perforated bottoms. Under each trough is another trough containing the liquid and into which the perforated surface of the upper trough dips. Vapour coming up between the liquid troughs forces the liquid up through the perforations and follows it, thus bubbling through the liquid in the normal way and rising up between the next higher liquid troughs. Drip pipes from each trough to the next lower are provided as in normal columns.

Recent experimental work in the U.S.A. (*Transactions of the American Institution of Chemical Engineers*, 1937, p. 315) shows that very high vapour velocities can be used without excessive entrainment, if the distance between plates is doubled. Figures are quoted showing that by increasing the plate spacing from 6 to 12 in. the diameter of the column can be reduced from 42 to 27 in. and the cost (with the same number of plates) is thus reduced by 40 per cent. Considerations of head room would prohibit this in some cases, and if a new building has to be provided, the extra cost of the higher building might easily counterbalance the reduced cost of the still. It would, therefore, be a case of ascertaining the most economic balance.

Another problem which arises in the distillation industry is the increasing tendency to complexity in the design of stills for a particular operation, and the temptation to try to arrange a continuously operating unit for the separation of a number of different products. Usually, it is excused on the grounds of a saving in steam or labour, or both, but it sometimes leads to difficulties in balancing the numerous columns so that they keep perfectly in step, and usually entails a much larger number of operating instruments and sometimes much higher buildings.

Separation of Alcohol from Water

With an ordinary two-column still separating alcohol from water, there are two alternatives. Either the rectifying column is above the analyser or the two columns are side by side. In the first case, the weak spirit from the base of the rectifier refluxes back to the analyser. In the second, the rectifier is provided with a few plates below the vapour feed and a small steam supply to strip the reflux coming down the rectifier, which in this case cannot be returned to the analyser. The difference in steam consumption in the two cases is negligible for practical purposes, but the heights of the buildings required are vastly different. Points such as these have, perhaps, not been given sufficient attention in the past.

Condensers form another subject which has been somewhat neglected by manufacturers of stills. It happens frequently that distillation plant supplied by different makers for exactly the same work is provided with condensers of widely varying size. In view of the large amount of work which has been done on heat transmission in condensers, it should be possible to standardise them fairly closely, though it must be remembered that most of this work deals with steam condensers and corresponding information on organic liquids is not nearly so complete.

In the manufacture of industrial alcohol, molasses is the cheapest raw material available and this is naturally used. The actual operations of dissolving the molasses in water, sterilising and fermenting the cooled solution with yeast, are so well known that description is unnecessary.

It may be remarked, however, that this is an industry which is called upon to supply a very pure product, and as considerations of taste or bouquet do not arise, the utmost advantage is taken of all the resources of chemical engineering science.

Purity of Product

In the fermentation, pure yeast cultures are used, specially selected to give the best results with molasses, and the operation is carried out in steel fermenters. In the same way, stills of the most modern design are used and questions of steam and water consumption are under constant examination.

The purity of the product is also rigidly controlled, as nowadays a very high quality is demanded. The ordinary two-column still, consisting of analyser and rectifier, is not capable of producing spirit of the purity necessary for some purposes, for though the strength is sufficiently high, the spirit still contains traces of aldehydes and other impurities. To eliminate these it is necessary to submit the alcohol to a purifying operation before final rectification.

Starting from the wash, the alcohol is stripped off in an

analysing column and the product is condensed. This results in the collection of a low strength spirit (about 40 per cent.) containing the various impurities. The weak alcohol is then fed into the middle of a purifying column. Sufficient steam is supplied to the bottom of this column to vapourise all the low boiling impurities and a small part of the alcohol, and at the top of the column heads are taken off containing practically all the impurities of a low boiling nature. The weak alcohol containing tails is run off at the foot of the column and is fed into the top of a short stripping column, and the vapour from this passes to the base of the rectifier. Heads are taken from the top of the rectifier to eliminate the last traces of low boiling impurities and the pure alcohol is removed in the liquid state from the third or fourth plate from the top. Near the foot of the column there is a zone where high boiling alcohols accumulate and these are tapped off continuously In this way, it is possible continuously to produce alcohol of a very high standard of purity. The procedure described covers one of the methods in use, but various other methods are also used.

Control of Fermentation

During the fermentation, every effort is made to keep it as pure as possible, and strict control is necessary, both in the cultivation of the inoculating bub from the pure yeast culture, and in the conditions of the fermentation as regards acidity and temperature.

With regard to the stills in use in the industry, the ordinary circular copper bubbler cap type is universal; in some distilleries analysing columns up to 11 ft. dia. are used.

In addition to 95 per cent. spirit, absolute alcohol is another product made in quantity in the industrial alcohol industry. Not many years ago the only process available was to distil 95 per cent. alcohol with large quantities of quicklime. This was a discontinuous operation and by no means convenient.

Nowadays, use is made of azeotropic distillation for the preparation of absolute alcohol. Some liquids, of which benzol is an example, form a ternary mixture with water and alcohol. This has a lower boiling point than either the alcohol-benzol or water-benzol binary mixtures, and these in turn are lower boiling than pure alcohol. The result is that the ternary mixture distils over as long as water is present followed by the alcohol-benzol binary and finally by the pure alcohol.

Another method of dehydrating alcohol, which has been successfully developed in recent years, depends upon the use of anhydrous salts for the removal of the water in ordinary 95 per cent. alcohol. The salts used in the process consist of a mixture of anhydrous sodium and potassium acetates, the mixture being used in order to lower the fusion point below that of either. The lowering of the fusion point makes it possible to keep the mixture in the molten state and dehydrate it by heating coils containing superheated steam.

A method of dehydrating which has been tried experimentally is the vacuum fractionation of 96 per cent. alcohol. Under a pressure of 50 mm. of mercury the constant boiling mixture of alcohol and water contains only a fraction of 1 per cent. of water. Theoretically, therefore, it is possible to produce a substantially absolute alcohol by fractional distillation under vacuum, and on the small scale it can be done. On an industrial scale the size of plant necessary rules it out.

Bakers' Yeast

The branch of the fermentation industry which deals with the manufacture of bakers' yeast is of comparatively recent date in this country. The history of the industry is one of constant technical progress, from the somewhat crude methods of the early Vienna process right up to the present day, when a modern yeast factory might vie in point of cleanliness with any hospital. This industry, therefore, is one in which the utmost advantage can be taken of the modern resources of chemical engineering.

Key Industry Duty

Revised List of Exemptions for Chemists

THE question of the renewal of the Safeguarding of Industries (Exemption) No. 8 Order, 1937, No. 9 Order, 1937, No. 10 Order, 1937, No. 1 Order, 1938, No. 2 Order, 1938, and No. 3 Order, 1938, made under Section 10 (5) of the Finance Act, 1922, is now under consideration by the Board of Trade. The articles covered by the Orders which exempt them from Key Industry duty until December 31, 1938, are:—

Compounds of rare earth metals, the following:—Celtium oxide, dysprosium oxide, erbium oxide, europium oxide, gadolinium oxide, holmium oxide, lutecium oxide, samarium oxide, scandium compounds, terbium oxide, thuilum oxide, ytterbium oxide yttrium oxide.

Synthetic organic chemicals, analytical reagents, other new chemicals and chemicals manufactured by fermentation processes, the following:—

Acetamidosalol (acetylamido phenol salicylate), acid adipinic, acid dipropyl-malonic, acid filicic, acid propionic, acyl derivatives of urea (acid isobutyl allyl barbituric, acid isopropyl barbituric, N-methyl-C-cyclohexanyl methyl malonyl urea, N-methyl-C-cyclohexanyl methyl malonyl urea-sodium, N-methyl ethyl phenyl malonyl urea, cyclohexenyl ethyl malonyl urea, sodium ethyl methyl butyl barbiturate); alcohol amido ethyl, allyl paracetaminophenol, amido guanidine sulphate, amidopyrin (dimethyl-amidoantipyrine), amidopyrin-barbitone, ammonium perchlorate.

Barbitone (Veronal, Malonal, Malourea, acid diethyl barbituric, diethylmalonylurea, Hypnogen, Deba), betain hydrochlorate, bromural (Dormigene), butyl esters (Butyl methyl adipate).

Calcium monoiodo behenate, cellulose ethers (ethyl cellulose, methyl cellulose), chinoline (quinoline), cocaine, crude, cumeno. pseudo, cyclohexanol esters and alkyl cyclohexanol esters (methyl cyclohexanol methyl adipote).

Dial (acid diallyl barbituric), dicyandiamide, didial (ethyl morphine diallyl barbiturate), p-diethoxy ethenyl diphenylamidine and its hydrochloride, dinito-orthocresol, diphenyl, diphenyl oxide.

Elbon (cinnamoyl para oxyphenyl urea), ethyl esters (ethyl abietate, ethyl benzoyl benzoate), ethylene bromide, eukodal, furfurol, germanium oxide, glyceryl (including diglyceryl and triglyceryl), esters (including natural oils and fats, synthetic resins and ester gums), the following:—Diglyceryl tetra acetate, glycol ethers, kryofin, lead tetraethyl, lipoiodin.

R. Mannite (R. mannitol), menthyl esters (menthyl ethyl glycollate), mercury compounds other than mercuric oxide and mercuric sulphide (N.-(Oxy-aceto-mercurio-propyl)-ethyl urethane) metaldehyde, methyl anidoxybenzoate, methyl anthranilate, methyl esters (oxymethyl para-oxyphenyl benzylamine methyl sulphate), methyl sulphonal (diethylsulphonemethyl-ethylmethane, Trional) methylene chloride, naphthyl esters (a-naphthyl isothiocyanate), nickel hydroxide.

Organo-arsenic compounds (copper methyl arsenate, 4-oxy-3 ethyl amino phenyl arsinic acid-n-methyl tetrahydro pyridine B-carboxylic acid methyl ester), oxy-acetophenone, meta-

Phenetidine, para-, phenetidyl-phenacetin and its hydrichloride, phenyl guanidine and other substitution derivatives of guanidine, and compounds thereof (decamethylene diguanidine dihydrochloride dodeca methyl diguanidine hydrichloride), phloroglucine, phytin, piperazine (diethylene-diamine, Dispermine), potassium ethylxanthogenate (potassium xanthogenate), potassium guaiacol sulphonate, R. potassium hydroxide (R. potassium caustic, R. potassium hydrate), quinine ethyl-carbonate.

Safrol, salol (phenyl salicylate), sodium phenyl dimethyl pyrazolone amino methane sulphonate, sulphonal, theorphylline, valeryl diethylamide, veratrine.

Vanadium compounds (vanadium silica compounds specially prepared for use as catalysts for sulphuric acid manufacture).

Any communication should be addressed to the Principal Assistant Secretary, Industries and Manufactures Department, Board of Trade, Great George Street, London, S.W.1, within one month from September 13, 1938.

Ten Years Back

From "The Chemical Age," September 15, 1928

Mrs. Evangeline Lindberg, mother of the aviator, has accepted the post of visiting professor of chemistry at the Constantinople Women's College.

* * * *

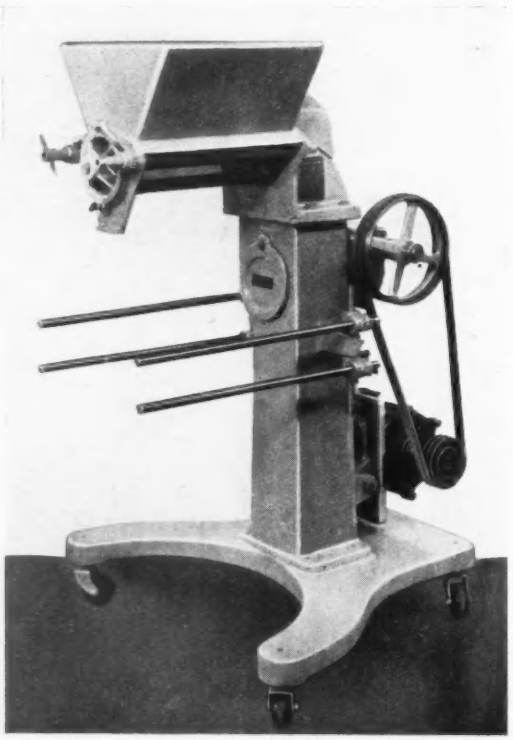
On Wednesday, August 22, Sir Charles Cottier, who had taken the lead in the negotiations in connection with the pending formation into a limited company of John Lovering and Co.'s China clay business, died suddenly at his residence near Henley.

A New Oscillating Granulator

Pharmaceutical and Industrial Uses

THE new Stokes oscillating granulator can be used for both moist and dry materials in making uniform pharmaceutical and industrial granulations. Where finely powdered materials have to be formed into granules, as in tablet making, the powders are first moistened with a granulating fluid, and then passed through the granulator. The dampened materials are rubbed through wire screens by the oscillating motion of a set of rolls to form granules, which are then dried—usually in compartment dryers—on trays. It is claimed that practically all the granulations required for tablet manufacturing, including extract mixture such as cascara, can be carried out with this machine, which is also ideal for the preparation of effervescent salines

Where granules have to be produced from lumps or aggregates of crystals, the material is passed through the machine in a dry condition. Thus it should find useful application for the breaking down of pre-compressed slugs into finished granulations, where the granulation for the tablet manufacture has been carried out by the "slugging" process. For



The new Stokes' oscillating granulator.

industrial granulations generally where the production of fine powder is a disadvantage, the granulator gives highly satisfactory results.

The granulator is rugged and powerful, and its action is quiet and smooth, because large bearings and machine-cut gears, some oil-immersed, are used in its construction. The machine is also easy to clean and has a large capacity. An outboard motor bearing assures proper lubrication without contamination of the product; this is an essential feature when dealing with pharmaceutical and food products.

The standard construction of the machine is of steel and cast iron. For the handling of corrosive and sensitive materials, however, machines made entirely in bronze, monel metal and stainless steel, or having only certain parts in contact with the material, are available. The belt driven model has fast and loose pulleys and a convenient belt shifter. Models are also supplied with a compact motor drive, the

Chemical Patents in India

An Increased Number of Applications

THE annual report of the Indian Patent Office for 1937 shows that there was a phenomenal increase in inventions relating to chemical industries, the number of applications in this group being nearly twice that of any of the preceding four years. A large number of these applications originated in Germany and the United States.

A considerable number of applications related to the manufacture of caustic alkali and alkali metal salts. The manufacture of new aldehyde condensation products or synthetic resins received special attention. The production of a new urea-formaldehyde composition which is flexible, transparent, and non-inflammable, and which contains no glass, formed the subject of one patent. It is stated that this new product is resistant to violent shocks and is transparent to infra-red and ultra-violet rays, and that when hardened the material can be worked like ordinary wood.

The revival of interest in azo-dyes noticed in the previous year was not maintained, the number of applications relating to these compounds being only about 50 per cent. of the preceding year. There was also a large increase in inventions relating to the metallurgical industries, and the revival of interest in alloys was particularly noticeable.

The manufacture of light-weight concrete was the subject of a number of applications. The production of ceramic materials having very low coefficients of expansion suitable for sealing to quartz or hard glass at high temperature without blistering, is of great practical importance in the manufacture of electric discharge devices and a new cementitious composition having these properties has been claimed.

There was a marked increase in inventions relating to dyeing and bleaching. The interests covered a wide range, such as processes for dyeing textile fabrics with diazotised bases and diazo salts in conjunction with naturally occurring colouring matters, the preparation of artificial wool from jute, and the production of new wetting agents from Indian vegetable oils. A number of foreign applications related to processes for imparting water repellant properties to cellulose materials.

THE PHYSICAL SOCIETY'S COMPETITION IN CRAFTSMANSHIP

THE Physical Society announces that the tenth annual craftsmanship and draughtsmanship competition will be held as usual in conjunction with its annual exhibition of scientific instruments and apparatus in January, 1939. Competitors must be in the regular employ of a firm or institution which will be exhibiting or has exhibited at least once during the previous three years, and which has been invited by the organising committee to enter its employees for the competition.

According to the judge's report on the last competition, in the senior grade of craftsmanship the standard was even higher than that of previous years, while in the junior grade the excellent standard reached in previous years was well maintained. Draughtsmanship showed a highly gratifying improvement in both grades, it being especially marked in the senior grade. Several drawings were so excellent that in the senior grade minor points had to be carefully balanced in making the final selection for awards; for this reason an extension of the prize list has been recommended.

(Continued from preceding column.)

1 h.p. motor being mounted on a hinged bracket, as shown in the illustration, and a V-flat belt drive being used; the machine is then self-contained When provided with casters it can be moved about the floor to each point where it is needed for use with other related equipment; in this way one machine can do the work of several stationary machines.

These machines are available for demonstration in the test laboratory of Apex Construction, Ltd.

Accidents with Explosives

Increased Number Occurring in Manufacture mainly due to Intensified Industrial Activity

THE 62nd annual report of H.M. Inspectors of Explosives for 1937 points out that inspection work has suffered on account of the call upon it for urgent work in other directions, particularly experimental and committee and advisory work for the Air Raid Precautions Department. The increased pressure on the department during the last few years made an increase of the staff inevitable, and towards the end of the year, the appointment of an additional inspector was sanctioned.

Dangers from Petroleum

Petroleum accidents have called for no special comment except that attention is again directed to the distressing series which occurs annually in the use of trivial quantities for cleaning and other general domestic purposes. Under this heading 30 accidents were reported causing 3 deaths, and injuries to 21 persons. This is a very high accident rate in proportion to the amount used for this purpose when it is realised that in connection with the conveyance, storage and use of the five million tons or so of petrol handled annually the number of accidents reported was only 41, involving 4 deaths and injuries to 40 persons.

The amateur manufacture of compositions containing chlorates and sulphur or phosphorus also frequently leads to serious accidents. The danger from these compositions, expressly prohibited by law, lies in their sensitiveness to friction and the violence of their action. When being ground by pestle and mortar for instance, explosions or detonations have occurred smashing the mortar to pieces and killing or maiming the operator. Manufacturers of chemical sets are again asked to assist in preventing these accidents.

Opportunities were taken whenever possible during the year to visit local authorities and to inspect stores and registered premises. The principal irregularities noticed were, insecurity, excess of explosive, and the storage of detonators with blasting explosives. A quantity of wet explosive was ordered to be destroyed. More attention should be paid to the security of places where explosive is stored. They must be kept securely locked and the key must not be accessible to unauthorised persons.

This year in factories licensed for the manufacture of explosives there has been an increase in the numbers of accidents and of the persons killed and injured over the average figures for the preceding ten years. Deaths numbered 11, and injured 30. The increase in the number of accidents is due no doubt to the general activity of the industry, but is partially accounted for also by a greater number of fires during the rolling of certain types of propellants (48 against 25 last year). Usually these fires are unaccompanied by any injuries to personnel or damage to plant.

Explosion at a Gunpowder Works

The most serious explosion for many years occurred on June 16, resulting in the death of four employees and injuries to one other. A corning house exploded followed by explosions in four other corning houses at short intervals. The factory was erected in 1933 and 1934, and the corning houses were built into the side of a hill, the roofs being covered with sand. The front of the buildings was of wood and glass, and about ten feet from the front was a mound, retained by a concrete wall on the building side. There were six corning houses in all and they ran in a line from north to south. The first explosion occurred in the most northerly building and about seven seconds later the gunpowder in the third corning house, 120 yards distant, exploded. The second corning house contained no explosive and damage was confined to broken windows. The remaining three corning houses exploded at intervals of a few seconds. The disturbing feature of this accident was the spread of the explosion along the line of the buildings.

The cause of the original explosion is doubtful, as the two occupants were killed outright, and most of the evidence was destroyed by the explosion, but it would appear that one of the men had just filled the hopper of the machine from a bogey and was returning with the empty bogey to the hoist. The other man was probably at the bottom of the hoist waiting to receive the empty bogey and send up a second filled one. The evidence available seems to show that everything was proceeding in the normal way; and after eliminating such causes as matches, lighting or sabotage, the most probable cause was either the presence of some foreign body in the fresh bogey load of powder or some unsuspected defect in the machine.

Automatic Control for Reduced Risks

These corning houses had been arranged for automatic working; but there was a general feeling that accidents can be, and probably have been, prevented by men present being able to detect a change in sound of a machine before a fault develops to a dangerous extent. In deference to this feeling one, or at most two, workers were allowed in the houses and it was proposed to develop the fully automatic system by degrees, when it would be necessary for men to enter the buildings occasionally only. The corning houses to be built in the future will not be sited in a line and will be constructed to "blow" into a hill and not into a narrow passage. The operation will be split up into stages, thus reducing the quantity of explosive in the building, and will be made as automatic as possible.

Two accidents occurred in connection with a small lead azide plant on consecutive days. On the first day 4 oz. of lead azide were being prepared and just before the completion of the process the plant was shut down for the dinner hour. On return the operator found that an explosion had taken place. It is possible that the lead azide being left in contact with water led to the formation of large crystals which detonated spontaneously. Only part of the lead azide detonated as on the following day when the operator was clearing up the debris and placing it in a pail a further explosion took place by which he was slightly injured.

This year two cases of the illegal mixing of chlorate and sulphur have been brought to our notice. In one case a boy purchased these chemicals and later on the same day another damaged a finger when he exploded a small part of the mixture with a key and nail. The chemist who sold the chemicals, wrapped them in the same piece of paper. He was subsequently prosecuted and fined.

Experiments and Chemical Work

In an investigation of the properties of glass used in safety screen of petrol lorries, a comparison of the resistance to heat and rough usage of wired and toughened glass was made and it was found that the toughened glass gave far better results in both cases. The glass was supported over a bunsen burner so that a circle about 3 inches diameter was strongly heated while water was dropped on the top at the rate of about two drops a second. Under these conditions the wired glass cracked in just over 10 seconds while the toughened glass was undamaged after two minutes heating when the experiment was stopped.

When a piece of the wired glass was placed flat on the anvil of the falling weight machine a hard steel ball could

be dropped on to it from a height of 6 inches without damage, even when dropped twice on to the same spot, but when the ball was dropped from a height of 9 inches the glass was always badly cracked. Under the same conditions the toughened glass resisted a fall of 18 inches without suffering any damage. In no case were any sharp edges produced when the toughened glass was broken. This toughened glass is therefore very superior to ordinary or wired glass for safety screens, but it must be remembered that when it is cracked it becomes practically opaque.

Further work on the effect of temperature on the sensitiveness of explosives is being done. Tests so far as they have gone show that the very marked effect on nitroglycerine is due to the reduction of viscosity at higher temperatures.

Petroleum Conveyance

Petroleum Spirit (Conveyance) Regulations to replace the Regulations of 1932 are now in course of preparation, and it is probable they will come into force during 1938. The primary object of these regulations is to include exemption orders which have been issued in the past by the Secretary of State under Regulation 27 of the Petroleum Spirit (Conveyance) Regulations, 1932, and opportunity has at the same time been taken to bring certain other points up to date. No change has been made in regard to the construction of the tanks of tank wagons.

Seventy-one accidents in connection with petroleum spirit and oil have been reported, causing seven deaths and injuries to 61 persons. Some of these accidents were not legally reportable under section 13 of the Petroleum (Consolidation) Act, 1928, but it is satisfactory to note that chief constables and local authorities do report details of accidents in connection with petroleum spirit even though no injuries to persons or loss of life occur.

The number of accidents during repair of tanks and storage plant have fortunately decreased. No welding, drilling, or operations of that nature should be carried out on any tank or receptacle which has contained petroleum spirit, unless it has been certified as vapour free.

Two accidents have been included under the heading of "Oil." Although oil as such is not controlled by the Petroleum Act, there is always the possibility that when accidents occur in connection with storage of oil that petroleum spirit may be involved, because a storage plant might have been at one time or another used for the storage of spirit, or in other ways contaminated with it.

Storage of Oil

The first of these accidents occurred in an oil works at Edinburgh, resulting in the death of one man who, at the time of the accident, was examining a tank into which hot oil residue was being pumped, with a view to seeing the amount of available space left in the tank. For this purpose the deceased used a torch which was of an approved pattern, and whilst doing so a slight explosion occurred followed by a fire. The definite cause of the ignition could not be ascertained, but it is possible that small quantities of petroleum spirit may have been present as the hot oil residues were taken from a plant used for the production of petroleum spirit. The second accident happened when kerosene was being pumped from a tanker into a storage tank.

A new Order in Council No. 30 (amending Order in Council No. 22 dated June 18, 1914) was made on February 2, 1937. The new Order permits the manufacture or keeping of acetylene up to a pressure not exceeding twenty-one pounds per square inch above that of the atmosphere provided that the manufacture and keeping is carried out only on such premises and under such conditions as may be approved by the Secretary of State. Steps are being taken to provide the necessary testing facilities at Woolwich before approval by the Secretary of State of the "conditions" which will include the use of safety devices.

Gas Cylinder Testing

In regard to the demand referred to in the last annual report for industrial cylinders lighter in weight than the present regulation cylinders it was explained that it was decided that a limited number of cylinders (3,000 from each bona fide applicant) after examination of samples by the National Physical Laboratory, should be put into use for a trial period of three years. A circular was sent out to this effect in October, 1936, and was reproduced in the technical press. Sample cylinders are being taken periodically for examination in order to ascertain from the results whether, after the expiration of the trial period, the specifications in the conveyance regulations can be amended. The first reports are satisfactory.

During the last four months of 1936 and the first four of 1937 there were a number of cases of low heat tests given by explosives containing ammonium nitrate and tri-nitro-toluol, with or without aluminium and barium nitrate. Such low heat tests might be due to any of the following causes: (1) Inherent incompatibility between the ingredients in question. (2) Organic impurities in the tri-nitro-toluol, e.g. tetra-nitro-methane. (3) Free acid in the tri-nitro-toluol interacting with the ammonium nitrate.

Explosive Mixtures

With reference to the first of these possibilities it is to be noted that the explosive mixtures in question have been in commercial use for many years without any trouble due to low heat tests. Hence any inherent incompatibility between the ingredients appears to be ruled out. To verify this point the various mixtures that have given trouble have been made up with well purified ingredients and submitted to a very severe storage trial, dry and wet, the temperature being 120° F. instead of the normal 90°.

The methods used for the purification of commercial tri-nitro-toluol should be quite satisfactory, provided that the tri-nitro-toluol is well agitated for a sufficient time with boiling water. As no difficulty was met with until the autumn of 1936, it is clear that sufficient elimination of free acid is commercially possible. It appears to be probable that the production of tri-nitro-toluol giving, by itself, a good heat test has been made so much easier, by the use of a sulphite wash, than it was before this process was introduced, that sufficient boiling is not now being done efficiently to remove the free acid.

ACCIDENTS IN MANUFACTURE, KEEPING, CONVEYANCE, AND USE AND MISCELLANEOUS, RESPECTIVELY, IN EACH OF THE LAST TEN YEARS.

Year	Manufacture.			Keeping.			Conveyance.			Use and Miscellaneous.			Total.		
	No. of Accidents	No. of Persons Killed	No. of Persons Injured	No. of Accidents	No. of Persons Killed	No. of Persons Injured	No. of Accidents	No. of Persons Killed	No. of Persons Injured	No. of Accidents	No. of Persons Killed	No. of Persons Injured	No. of Accidents	No. of Persons Killed	No. of Persons Injured
1937	112	11	30	2	1	1	—	—	—	283	23	299	397	35	330
1936	73	3	21	4	—	1	—	—	—	240	22	251	317	25	273
1935	52	5	19	—	—	—	—	—	—	265	22	283	317	27	302
1934	38	—	14	2	—	2	1	—	1	233	21	250	274	21	267
1933	41	2	16	1	1	—	1	—	—	201	33	202	244	36	218
1932	45	4	10	—	—	—	—	—	—	227	31	241	272	35	251
1931	22	2	10	1	—	1	1	—	—	225	24	241	249	26	252
1930	40	1	15	1	—	—	—	—	—	289	31	316	330	32	331
1929	60	—	20	—	—	—	1	—	1	283	38	295	344	38	316
1928	94	10	17	2	—	4	—	—	—	270	25	280	366	35	301
Average for 10 years 1928-37	57.7	3.8	17.2	1.3	.2	.9	.4	—	.2	251.6	27.0	265.8	311.0	31.0	284.1

Chemical Notes from Foreign Sources

Norway

MANUFACTURE OF WAXED CLOTH is contemplated by the Askim Rubber Goods Co.

Poland

SILICON CARBIDE MANUFACTURE will be commenced this year by the Electro Co. at Oberlazik.

Italy

PARODI AND MASCAZZINI, of Genoa, are to erect a plant for regenerating zinc from waste material.

Roumania

FORMATION IS ANNOUNCED at Otopeni of the Industria-chimico-technica Co., with a capital of 2 million lei.

Russia

A NEW METHOD OF VANILLIN synthesis now being operated by the Russian perfume industry is understood to utilise phenol as starting material.

Jugoslavia

THE STATE SUGAR FACTORY, at Cukarica, near Belgrade, has been authorised to erect a spirit factory with an annual capacity of 1.5 million hectolitres of alcohol.

Japan

THE NITTO KAGAKU KOGYO K.K. intends to undertake the manufacture of aluminium from alunite by a new process.

AN ANNUAL OUTPUT CAPACITY of 20,000 lb. of nicotine sulphate is possessed by the recently formed Nicotin Kogyo K.K., of Tokio.

France

FISH WASTE WILL BE CONVERTED into fertiliser at a factory which it is proposed to erect at Hesdigneul-les-Boulogne.

A NEW WOOD CARBONISATION CONCERN has been registered in Paris under the style of Soc. Alsacienne de Carbonisation, and will operate a wood-distillation plant in the Strassburg district.

Holland

THE N.V. NEDERLANDSCHE LINOLEUMFABRIEK announces a net profit of 234,811 guilders in 1937 (previous result 277,240), out of which a dividend of 12.2 per cent. is being distributed.

SATISFACTORY TRADING IN THE PAST YEAR is reported by the N. V. Koninklijke Pharmaceutische Fabrieken v/h Boreades-Stheeman and Pharmacia notwithstanding the fall in prices, and the factories at Meppal and Nijmegen were working to capacity. Out of a net profit of 145,099 florins against 115,073), the ordinary shares receive a dividend of 9 per cent. (8 per cent.) and the preference shares 5 per cent. as before.

Germany

PRODUCTS OF OXIDATION OF PARAFFIN WAX have been analysed at Hamburg University by Jantzen, Rheinheimer and Asche, an account of whose results is published in the August issue of *Fette und Seifen*. Starting from a paraffin wax mixture prepared by the Fischer-Tropsch process and consisting of saturated hydrocarbons from $C_{16}H_{34}$ to $C_{28}H_{58}$, the resulting fatty acid mixture was found to contain almost exclusively the normal saturated fatty acids. No evidence was found of the presence of acids with iso chains, of cyclic acids or of dicarboxylic acids. A series of acids was separated into pure fractions by way of the methyl esters and fractional distillation under reduced pressure. Applying Young's law, the presence of the following normal fatty acids was deduced: Acids up to C_7, 7.35 per cent, caprylic acid 4.25 per cent., pelargonic acid 5.7 per cent., capric acid 7.4 per cent., undecanic acid 6.2 per cent., lauric acid 7.65 per cent., tridecanic acid 8.3 per cent., myristic acid 8.75 per cent., pentadecanic acid 9 per cent., palmitic acid 6.7 per cent., heptadecanic acid 6.25 per cent., stearic acid 4.25 per cent., acids above C_{18} 18.2 per cent.

Finland

A WHITE LEAD FACTORY is now being built at Helsingfors by the Finska Kolsyreindustrie A.B., in conjunction with their carbon dioxide factory.

PLANS ARE BEING DRAWN UP TO investigate the suitability of native deposits of alumina as raw material for aluminium sulphate manufacture.

Czechoslovakia

REFINING AND PRESERVING AGENTS for fats will be manufactured by Anna Ruzkova and Co., recently formed in Prague.

MANUFACTURE OF A SERIES OF SPECIAL COLOURS and stains is to be commenced by the firm of Ernst Hiltmann, at Dux.

PRINTING INKS ARE TO BE ADDED to the range of products turned out by the Chemische Werke A.G. Hochstetter and Schickardt, of Brunn.

Personal Notes

MR. GEOFFREY WALLEY, B.Sc., F.I.C., chemist in the laboratory of Lever Bros., Port Sunlight, Ltd., was last week married to Miss Margaret Lonergan, a tester at Port Sunlight.

SIR EDWARD T. F. CROWE has been appointed a director of Samuel Courtauld and Co., Ltd., and of Lustre Fibres, Ltd., both of which companies are subsidiaries of Courtaulds, Ltd.

MR. A. G. LIPSCOMB, F.I.C., chief chemist of Caleys, of Norwich, is to give a series of six lectures on the storage of foodstuffs and sweetstuffs, at the Norwich Technical College, commencing on October 4.

Mr. Joseph Wainwright, works director of Lever Brothers, (Port Sunlight) Ltd., who, as announced in last week's issue, has completed fifty years' service with the company.

MR. WILLIAM HOWARD REES, B.Sc., of Garnant, Ammanford, South Wales, a graduate of the University of Bangor, has been appointed research physicist on the staff of the British Cotton Industries Research Association at Didsbury, Manchester.

THE Imperial Council of Agricultural Research, India, is considering the question of cultivation of red palm in South India. It has been found that oil obtained from this palm can replace cod liver oil.

References to Current Literature

Inorganic

Chemical dehumidification of air. Weisselberg, *Chem. Met. Eng., 45,* 418-421.

Molybdenum blue. Rinne, *Z. analyt. Chem., 113,* 241-247.

Non-metallic substances by electro-chemical methods. Müller, *Chem. Ztg., 62,* 621-624.

Nickel carbide. Kohlhaas and Meyer, *Metallwirtsch, 17,* 786-790.

Organic

Fixation of active nitrogen by organic compounds. Howard and Hilbert, *J. Amer. Chem. Soc., 60,* 1,918-1,924.

Polymerisation of butene mixtures by phosphoric acid catalyst. Ipatieff and Schaad, *Chim. et Ind., 40,* 211-216.

Aromatisation of paraffins by aluminium chloride. Otin and Dima, *Chim. et Ind., 40,* 217-227.

Complex copper salts with alkylated ethylene diamine. Pfeiffer and Glaser, *J. prakt. Chem., 151,* 134-144.

Di-carbon. Klemenc and Wagner, *Z. anorg. Chem., 239,* 1-13.

Analysis

Rapid analysis of type metals. Laurent, *Ann. Chim. analyt., 20,* 208.

Silver method for determining arsenic. Sarudi, *Z. analyt. Chem., 113,* 248-251.

Effect and identification of traces of phosphorus and arsenic in metallic platinum. Fischer, *Chem. Fabrik, 11,* 406-408.

Determining sulphur content of organic substances using catalysts. Rudolf, *Z. analyt. Chem., 113,* 325-326.

Rapid determination of glycerine in aqueous solutions. Juhlin, *Z. analyt. Chem., 113,* 339-340.

Determining sulphur using oxidising alkali fusions. Bernoulii and Stauffer, *Z. analyt. Chem., 113,* 340-342.

Direct determination of rubber. Kheraskova and Korsunskaya, *Caoutchouc Gutta-Percha, 35,* 235.

Mineral Oils, Gas, Tar

Refinery and natural hydrocarbon gases. Auer, *Refiner, 17,* 395-398.

Production of hydrocarbon oils from industrial gases. Myddleton, *J. Inst. Fuel, 11,* 477-492.

Catalysts for the gassing of wood charcoal in steam. Kröger and Willenberg, *Z. Elektrochem., 44,* 524-536.

Purification, storage and separation of gaseous fuels. Schuster, *Chem. Apparatur, 25,* 243-246.

Producer gas. Müller, *Gas u. Wasserfach, 81,* 590-599.

Temperature sensitivity of viscous oils. Kreulen, *J. Inst. Petroleum Techn., 24,* 441-452.

Principles of solvent dewaxing. Ba Thi, Hunter and Nash, *J. Inst. Petroleum Techn., 24,* 453-467.

Oxidation of mineral transformer oil. Clark, *Petroleum World, 35,* 168-169.

Recovering asphalt from mixtures. Suida and Hoffmann, *Refiner, 17,* 386-388, 405.

Cellulose, Paper

Delignification in magnesium base liquor. Calhoun, Cannon, Yorston and Maas, *Canadian J. Research, 16,* B, 242-252.

Cellulose glycol ether. Wakelin, *Silk and Rayon, 12,* 868-874.

Nitrocellulose adhesives. v. Artus, *Gelatine Leim Klebstoffe, 6,* 127-135.

Cellulose fibres from tropical woods. Muhlsteph, *Papier Fabrik (techn. Teil), 36,* 352-356.

Chip length and uniformity of delignification in sulphite pulping. Morgan and Dixon, *Paper Trade J., 107,* No. 7, 38-40.

Colour and the paper industry. Mayo, *Paper Maker, 96,* TS 141-144.

Chemistry of cooking. Seiberlich, *Pulp and Paper, 39,* 625-626.

Bleaching, Dyeing, Finishing

Dyeing cellulose esters and acetate. Wakelin, *Rayon Text. Monthly, 19,* 483-485.

Identification of rayons. *Rev. Univ. Soie Text. Art., 13,* 251-253.

Manufacture of cuprammonium rayon. *Seide u. Kunstseide, 43,* 285-288.

Bleaching of bast fibres. Kayser, *Melliand Textilber., 19,* 725-727.

Action of light on cellulose fibres. Henk, *Melliand Textilber., 19,* 730.

Determining wetting-out and detergent properties of surface-active chemicals. Thomas, *Text. World, 88,* No. 9, 48-49.

Rayon sizing tests. Bentley, *Text. World, 88,* No. 9, 42-43.

Glass, Ceramics

Developments in the enamel industry. Karmaus, *Korrosion u. Metallschutz, 14,* 285-294.

Clays and bleaching earths. Schwarz, *Sprechsaal, 71,* 415-418, 429-431.

Causes of optical impurities in glass. *Glashütte, 68,* 577-578.

Metals and oxides of iron, nickel and cobalt in fired ground coats. Kautz, *J. Amer. Ceram. Soc., 21,* 307-311.

Metals, Electrometallurgy

Industrial electroplating processes. Taormina, *Metal Ind., 53,* 253-257.

Metal crystals. Chalmers, *Metal Ind., 53,* 243-246.

Aluminium in chemical plant. Smith, *Light Metals, 1,* 295-298.

Hardened oxide layers on aluminium apparatus. Röhrig and Lux, *Chem. Apparatur, 25,* 241-243.

Lead for chemical plant. Jones, *J. Soc. Chem. Ind., 57,* 251-259.

Fats, Oils, Waxes

Continuous deodorising of edible oils. Dean and Chapin, *Oil and Soap, 15,* 200-202.

Medicated soaps. *Seifensieder Ztg., 65,* 608-609.

Oils and fats in the soap industry. Davidsohn and Davidsohn, *Soap Perfum. Cosmetics, 11,* 794-800.

Paints, Pigments, Resins

Organic protective coatings in apparatus construction. Peters, *Korrosion u. Metallschutz, 14,* 258-262.

Rust protective paints from talloil. Schlenkert, *Farbe u. Lack,* 1938, No. 31, 365-366.

Phenolic varnish resins of the heat-hardening type. Hönel, *J. Oil Col. Chem. Assoc., 21,* 247-276.

Rubber, Plastics

Trends in the plastics industry. Yarsley, *Chem. and Ind., 57,* 849-851.

Physico-chemical researches in artificial resins. Jenckel, *Angew. Chem., 51,* 563-566.

Inks from rubber. Crawford and Foreman, *Rubber Age (U.S.A.), 43,* 281-284.

Miscellaneous

Trends in chemical engineering Cumming and Rumford, *Chem. and Ind., 57,* 851-859.

Filling materials for distillation columns and the separation of liquids. Fuchs and Roth, *Chem. Fabrik, 11,* 401-406.

Testing germicides. Reddish, *Ind. Eng. Chem. analyt. ed. 10,* 425-427.

Ball, rod and tube mills. Withington, *Ind. Eng. Chem., 30,* 897-904.

Condensation of mixed vapours. Wallace and Davison, *Ind. Eng. Chem., 30,* 948-953.

Pebble and ball mills. Underwood, *Ind. Eng. Chem., 30,* 905-915.

Photographic development. Lüppo-Cramer, *Chem. Ztg., 62,* 609-611.

Mineral Production in Canada

Gold Production Offsets Reduced Value of Other Minerals

MINERAI production in Canada during the first six months of this year reached a total value of $209,654,000, as compared with $215,382,814 for the corresponding period of last year. Gains are recorded in the output of most base metals, but lower prices for copper, lead and zinc together with lessened production of several important non-metallic minerals reduced the total value by 2.7 per cent. The gold mining industry continued to expand and the increase in production, together with the remarkable advance in oil output in the Turner Valley field of Alberta, tended greatly to offset the drop in value reported for some of the other mineral products.

In the metals group, gains in output are recorded for copper, gold, lead, metals of the platinum group, selenium, silver and zinc, but so far as value is concerned gold and silver only show an increase. New goldfields are being developed and mines are being brought rapidly to the producing stage. Properties in some older camps which were discarded years ago when gold was valued at $20.67 per ounce are being rejuvenated with remarkable success; prospecting is being carried on in many promising districts.

From Week to Week

ROTHERHAM COLLEGE OF TECHNOLOGY has issued its prospectus and time table for the 1938-39 session.

BROWN AND ADAM, LTD., bleachers and dyers, Pollokshaws, Glasgow, are to carry out extensions to their works.

THE TRIPLEX SAFETY GLASS CO. has lost the Austin Motor contract. A report to this effect which has been current for some time past was confirmed by Mr. Graham Cunningham, the chairman, at the recent company meeting.

THE ADDRESS OF THE SOCIETY OF GLASS TECHNOLOGY, on and after Monday next, will be: "Elmfield," Northumberland Road, Sheffield, 10. Telegrams: "Research, Phone, Sheffield." Telephone: Sheffield, Broomhill 62467.

ACCORDING TO A SPECIAL ARTICLE in the *Board of Trade Journal* price charges for 15 items classified as chemicals and oils were indexed at 94.2 for August, 1938, as compared with 99.9 for August, 1937 (on the basis of 1930 = 100).

WILLIAM CUMMING AND CO., LTD., ironfounders' facings manufacturers, Glasgow, have been congratulated by the A.R.P. authorities and Glasgow Corporation on being the first firm in Glasgow to provide an air raid shelter for their employees.

SILICOSIS ALLEGED TO BE CAUSED BY HER OCCUPATION in the scouring products department of Lever Bros., Ltd., Port Sunlight, was said to be the cause of the death of Winifred Sweeney (24), of Rock Ferry, on whom an inquest was held at Birkenhead last week.

AN UNUSUAL FREIGHT BUSINESS has developed recently on the L.M.S. Railway. It concerns the transport of Lock Katrine water over the 400 miles route to London. The water is taken south for distilling purposes, the empty casks being returned to the lake for refilling.

IN CONNECTION WITH THE SEARCH FOR OIL at Dalkeith, Midlothian, plans are being discussed by officials of the D'Arcy Exploration Co. to concentrate their search on the new bore at Southfield, and to suspend operations at an early date at Cousland, where the first bore was sunk.

THE HULL DEVELOPMENT COMMITTEE report the successful conclusion of negotiations for larger premises of two of the new enterprises established in Hull in recent years. One of these is for the production of textile soaps and chemicals, and the other is a branch of the foodstuffs industry. The latter will be the first building in a new area which is now being developed as an industrial estate for light industries.

THE TECHNOLOGICAL INSTITUTE OF GREAT BRITAIN have issued a souvenir book which commemorates their coming of age. Their prospectus, "The Engineer's Guide to Success," contains particulars of over 200 correspondence courses in engineering and allied technology, and will be sent to readers free on application to the Technological Institute of Great Britain, Temple Bar House, London, E.C.4.

A RESTRICTION AGREEMENT FOR LEAD has been concluded. At meeting of producers held in London this week it was decided to form a Lead Producers' Association, which will take the necessary steps to bring production and consumption into balance. The producers represented at these meetings probably control more than 75 per cent. of the non-U.S. lead output; and other producers are to be invited to join the agreement.

RISING COSTS AND PRICES, a shortage of labour and adverse weather last year resulted in the lowest sugar beet yield in this country since 1932. The report of the sugar Commission for the year ended March 31, states that the acreage sown to beet during the year was 312,984, which was 19,223 less than the contracted acreage. The average yield, 8.25 tons to the acre, was the lowest since 1931, and was below the average of the preceding 10 years. Land under sugar beet this year in Lincolnshire has increased by 1,231 acres since last season.

THE MANUFACTURE OF GLACE KID PRODUCTS will be commenced at Barrhead in December, and will provide employment for about 100 workers.

SEVERAL CHEMISTS from Gilbertson's Steelworks, Pontardawe, South Wales, have been transferred to take up duties at the new Ebbw Vale works of Richard Thomas and Co.

INCREASED ACTIVITY has recently been apparent at the huge Swiss chemical works around Basle, which manufacture 17 per cent. of all the poison gas produced in Europe.

CHEMISTS AT DALZELL STEEL WORKS, Motherwell, met socially last week to honour the only lady member of the laboratory staff, Miss M'Nab, on the occasion of her marriage.

THE PLANT WHICH THE BRITISH ALUMINIUM CO. is to erect at Newport, Mon., will be built in co-operation with Swiss and Canadian interests. The acquisition of the necessary land was announced at the meeting of the company on March 30. The development is regarded as important, as there have been rumours for some time that a Swiss company intended to erect on its own account a reduction plant in Monmouthshire.

THE LONDON PRESS EXCHANGE were "At Home" on the occasion of opening their new office in the Team Valley Central Building, on September 9. Mr. R. S. Forman, head of the editorial department, said the new office represents in some measure the professional service the London Press Exchange is able to give to the industrial tenants who themselves are so implicitly bound up with the success of Team Valley Trading Estate.

THE CHINA CLAY SHIPMENTS for August have shown a little improvement, but are still very low in comparison with the corresponding month of 1937. Foway shipped 35,521 tons of china clay, 1,708 tons of china stone, 1,512 tons of Ball clay, which is less than last year by 7,267 tons. Par was lower than usual—8,810 tons of china clay, 498 tons of china stone. Charlestown 3,628 tons of china clay, 708 tons of china stone. Plymouth 708 tons of china clay, and 5,037 tons of china clay was despatched by rail.

THE DEPARTMENT OF OVERSEAS TRADE announces that Mr. W. D. M. Clarke, H.M. Trade Commissioner at Bombay, is now in the United Kingdom on an official visit. Mr. Clarke will be at the Department of Overseas Trade on October 10 and 11, for the purpose of interviewing manufacturers and merchants interested in the export of United Kingdom goods to Northern and Western India, after which he will undertake a short tour of some of the more important industrial centres in the provinces. Firms who desire an interview with Mr. Clarke should apply to the Department of Overseas Trade, 35 Old Queen Street, London, S.W.1, quoting reference 7933/1938. Mr. J. W. Brigden, H.M. Trade Commissioner at Johannesburg, is in the United Kingdom on a similar official visit. Mr. Brigden will be at the Department of Overseas Trade in the week October 3. Firms who desire interviews with Mr. Brigden should quote reference 7931/1938.

A REPRESENTATION HAS BEEN MADE TO THE BOARD OF TRADE under Section 10 (5) of the Finance Act, 1926, regarding cellulose triacetate. Section 10 (5) of the Finance Act, 1926, is as follows: "The Treasury may by order exempt from the duty imposed by Section one of the Safeguarding of Industries Act, 1921, as amended by this Act, for such period as may be specified in the order, any article in respect of which the Board of Trade are satisfied on a representation made by a consumer of that article that the article is not made in any part of His Majesty's dominions in quantities which are substantial having regard to the consumption of that article for the time being in the United Kingdom, and that there is no reasonable probability that the article will within a reasonable period be made in His Majesty's dominions in such substantial quantities." Any communication should be addressed to the Principal Assistant Secretary, Industries and Manufactures Department, Board of Trade, Great George Street, London, S.W.1, before October 14, 1938.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

SEPARATION OF HYDROGEN CHLORIDE from mixtures containing olefines or diolefines.—G. W. Johnson (I. G. Farbenindustrie.) 25498.

MANUFACTURE OF STABLE EMULSIONS.—Neukölner Olmühle G. P. Lehmann and Co., Ges. (Germany, Aug. 31, '37.) 25537.

PREPARATION, ETC., OF FERTILISERS.—F. Niblock. 25456.

PRODUCTION OF TECHNICALLY VALUABLE CHLORINATED HYDROCARBONS.—Röhm and Haas, A.-G. (Germany, Aug. 30, '37.) 25420.

PRODUCTION OF HYDROGEN PEROXIDE from solutions.—H. Schmidt. 25526.

MANUFACTURE OF AZO-DYESTUFFS.—Soc. of Chemical Industry in Basle. (Germany, Aug. 27, '37.) 25107; (Germany, July 6.) 25108.

POLYMERISATION OF UNSATURATED GASEOUS HYDROCARBONS.—Standard Oil Development Co. (United States, Oct. 1, '37.) 25046.

METHOD OF MAKING ANHYDROUS MONO-CALCIUM PHOSPHATE, ETC.—A. H. Stevens (Victor Chemical Works). 25391, 25392.

PROCESS FOR IMPROVING THE PRODUCTS OF THE SYNTHESIS OF HYDROCARBONS from carbon monoxide and hydrogen.—Synthetic Oils, Ltd., and W. W. Myddleton. 25496.

CHEMICAL REACTIONS involving the presence of finely divided solid materials.—N. Testrup, T. Gram, and Techno-Chemical Laboratories, Ltd. 25083.

FERMENTATION OF ORGANIC MATTER.—C. S. Townsend. 25016.

MANUFACTURE, ETC., OF HIGH QUALITY BENZINE, ETC.—F. Uhde, and T. W. Pfirrmann. (Germany, Aug. 30, '37.) 25287.

PROCESS FOR THE CONVERSION OF HYDROCARBON OILS.—Universal Oil Products Co. (United States, Sept. 13, '37.) 25432.

PRODUCTION OF HEMI-CELLULOSE MATERIAL from wood, etc.—A.-G. für Halbzellstoff-Industrie. (Germany, Sept. 6, '37). 26066.

METHOD ETC. OF DEACIDIFYING STAND OILS, ETC.—Albert Products, Ltd. (Germany, Sept. 7, '37.) 25966.

PRODUCTION OF SILICATE FUSIONS THICKENED WITH ZIRCONIUM OXIDE.—Auerges. A.-G. (Germany, Sept. 14, '37.) 26095.

METHOD, ETC., OF DE-ACIDIFYING STAND OILS, ETC.—Albert Pro-Verein für Gussstahlfabrikation A.-G. (Germany, Nov. 2, '37.' 26152.

EXTRACTION OF HORMONES.—British Drug Houses, Ltd., and P. G. Marshall. 25841.

PROCESS FOR MAKING ALKENYL BENZENES.—Carbide and Carbon Chemicals Corporation. (United States, Sept. 2, '37.) 25672.

PROCESS OF RECOVERING AMMONIA FROM FUEL GASES.—F. J. Collin, A.-G., J. Schafer and E. Jacobs. 25625.

INTERMEDIATE PRODUCTS, ETC.—Compagnie Nationale de Matieres Colorantes et Manufactures de Produits Chimiques du Nord Reunies Etablissements Kuhlmann. (France, Sept. 4, '37.) 25875.

TREATMENT OF POLYMERISABLE COMPOUNDS.—J. W. C. Crawford, N. McLeish, and Imperial Chemical Industries, Ltd. 25954.

PRODUCTION OF WATERPROOF CELLULOSE VESSELS, ETC.—F. B. Dehn. 25770.

ELECTRICALLY HEATED SALT MELT BATH.—Deutsche Gold- und Silber-Scheideanstalt vorm. Roessler. (Germany, Oct. 1, '37), (Germany, Sept. 14, '37.) 26188, 26189.

POLYMERISATION OF POLYMERISABLE ORGANIC LIQUIDS.—E. I. Du Pont de Nemours & Co. (United States, Sept. 1, '37.) 25655.

COATING-COMPOSITIONS FOR WIRES, ETC.—E. I. Du Pont de Nemours & Co., and F. J. Emig. 25956.

MANUFACTURE OF AZO DYESTUFFS.—E. I. Du Pont de Nemours and Co., M. R. Murphy. (Legal representative of A. R. Murphy), and H. Jordan. 26191.

METHOD OF PREPARING TETRAZYLAZIDE, ETC.—Dynamit-A.-G. vorm A. Nobel and Co., and W. Friederich. 26132.

MANUFACTURE OF BITUMINOUS SUBSTANCES.—Ebano Asphalt-Werke A.-G. (Germany, Sept. 6, '37.) 25650.

SOAP.—J. Egli, and M. Staubli. (Switzerland, Sept. 1, '37.) 25573.

PREPARATION FOR COMBATING PESTS, ETC.—O. Fivian, and E. Loosli. 25702.

ZINC COATED IRON, ETC.—E. Ford. 25561.

MANUFACTURE OF CONDENSATION PRODUCTS.—J. R. Geigy, A.-G. (Switzerland, June 14.) 25629.

MANUFACTURE OF BASIC CONDENSATION PRODUCTS.—J. R. Geigy, A.-G. (Switzerland, July 18.) 25630.

MANUFACTURE OF *o*-HYDROXYDISAZO DYESTUFFS.—J. R. Geigy, A.-G (Switzerland, Sept. 7, '37.) 25908.

MANUFACTURE OF SUBSTANTIVE POLYAZO DYESTUFFS.—J. R. Geigy, A.-G. (Switzerland, Sept. 7, '37.) 25909.

WETTING, ETC., AGENTS FOR THE TREATMENT OF TEXTILES.—J. R. Geigy, A.-G. (Switzerland, Sept. 7, '37.) 25910.

THICKENING-AGENTS.—H. Gossler. (France, Sept. 7, '37.) 26022.

MANUFACTURE OF PRODUCTS CONTAINING FATS.—M. Graham. 25791.

MANUFACTURE OF CYCLIC BASES.—W. W. Groves (I. G. Farbenindustrie.) 25588.

MANUFACTURE OF PYRROLIDONE DERIVATIVES.—W. W. Groves (I. G. Farbenindustrie.) 25589.

MANUFACTURE OF PYRAZOLONE DERIVATIVES.—W. W. Groves (I. G. Farbenindustrie.) 25713.

MANUFACTURE OF ACTIVE SUBSTANCES FROM SUPRARENAL CAPSULES.—W. W. Groves (I. G. Farbenindustrie.) 25824.

MANUFACTURE OF DICHLOROBUTENES.—W. W. Groves (I. G. Farbenindustrie.) 25825.

MANUFACTURE OF ACYLOXY-ACRYLIC ACID NITRILES.—W. W. Groves (I. G. Farbenindustrie.) 25923.

MANUFACTURE OF PHENYLOXYNAPHTHIMIDAZOLE-SULPHONIC ACIDS, ETC.—W. W. Groves (I. G. Farbenindustrie.) 25924.

DOLOMITIC MAGNESIUM CARBONATE COMPOSITION, ETC.—D. H. Grunwald. 26015.

MANUFACTURE OF ASBESTOS CEMENT, ETC.—H. Hatschek, and H. Czerwenka. (Austria, Sept. 3, '37.) 25953.

MANUFACTURE OF ANHYDROUS MAGNESIUM OXYCHLORIDE, ETC., from magnesium chloride.—A. Hausdorff. (Palestine, Sept. 14, '37.) 26169.

RENDERING TEXTILES, ETC., SHRINK-PROOF.—Haberlein and Co. A.-G. (Oct. 12, '37.) 25606.

SCREENING PICTORIAL PATTERNS.—Heberlein and Co., A.-G. (Oct. 28, '37). 25607.

MANUFACTURE OF PHENYLPYRIDINE DERIVATIVES.—I. M. Heilbron, J. W. Haworth, D. H. Hey, and Imperial Chemical Industries, Ltd. 26064.

MANUFACTURE OF PAPER.—A. Holm. 25937.

MANUFACTURE OF CAPILLARY ACTIVE PRODUCTS.—I. G. Farbenindustrie. (Germany, Sept. 1, '37.) 25653.

MANUFACTURE OF AMINO-SULPHONIC AND AMINO-CARBONYLIC ACIDS.—I. G. Farbenindustrie. (Germany, Sept. 1, '37.) 25654.

VAT DYESTUFFS.—I. G. Farbenindustrie. (Germany, Sept. 4, '37.) 25776.

DEPOLYMERISATION OF HIGHER BOILING UNSATURATED HYDROCARBONS.—I. G. Farbenindustrie. (Germany, Sept. 7, '37.) 25930.

MANUFACTURE OF AZO-DYESTUFFS.—I. G. Farbenindustrie. (Germany, Sept. 7, '37.) 26184.

ARTICLES OF MANUFACTURE from bast, etc., fibres, etc.—H. B. Jackson, L. Mellersh-. (Allen, Kent, and Packer). 26172.

REMOVAL OF CARBON MONOXIDE FROM GAS MIXTURES.—G. W. Johnson (I. G. Farbenindustrie.)—26157.

MANUFACTURE, ETC., OF TRIHYDROXYALKYL SULPHONIC ACIDS.—G. W. Johnson (I. G. Farbenindustrie.) 26158.

AGENTS FOR COMBATING MICRO-ORGANISMS.—G. W. Johnson (I. G. Farbenindustrie.) 26160.

MANUFACTURE OF COATED PAPER.—K-C-M. Co. (United States, March 21.) 25727.

METHOD FOR THE RECOVERY OF A HIGH-GRADE CRUDE PRODUCT for the recovery of a high-grade product from enriched benzole waste-oil.—H. Koppers' Industrieele Maatschappij, N.V. (Germany, Sept. 2, '37.) 25746.

OXIDIC PROTECTING-LAYERS OF MAGNESIUM, ETC.—Langbein-Pfanhauser-Werke, A.-G., G. Elssner, and E. Schröder. 25673.

PRODUCTION OF NITRITE ESTERS of non-phenolic organic compounds.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (United States, Sept. 17, '37.) 26193.

PRODUCTION OF ALLYL TYPE HALOGEN-CONTAINING DERIVATIVES OF PROPENE.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (United States, Sept. 17, '37.) 26194.

PRODUCTION OF HYDROXYKETONES OF THE CYCLOPENTANOPOLYHYDROPHENANTHRENE SERIES.—Naamlooze Vennootschap Organon. (Holland, Sept. 3, '37.) (Holland, Jan. 29.) 25758, 25759.

CONTINUOUS SOLVENT EXTRACTION APPARATUS.—National Distillers Products Corporation. (United States, Nov. 24, '37.) 26089.

ELECTROLYTIC PRODUCTION OF MANGANESE.—H. E. Potts (Atack). 25876.

PREPARATION OF HIGHER FATTY ALDEHYDES.—A. W. H. Ralston, and R. J. V. Wal. 26016.

GLAZING.—J. A. Roberts, and Imperial Chemical Industries, Ltd. 25955.

MANUFACTURE OF STEEL.—Ruhrstahl A.-G. (Germany, Sep. 9, '37.) 26084.

TREATMENT OF OLEFINIC HYDROCARBONS.—R. F. Ruthruff. 25608.

MANUFACTURE OF DERIVATIVES of the dihalogen hydroxy benzoic acids.—Schering A.-G. (Germany, Sept. 1, '37.) 25651.

REGENERATION OF PROTEIN ANIMAL SUBSTANCES, ETC.—Soc. Anon. Brevetti Mario Piacenza. (Italy, Sept. 18, '37.) 26155.

MANUFACTURE OF SYNTHETIC STONE, ETC.—Springbank Quarry Co., Ltd., H. K. Symington, and J. S. Paxton. 25814.

MANUFACTURE OF PHENOL SULPHIDES.—Standard Oil Development Co. (United States, Dec. 4, '37.) 25600.

MANUFACTURE OF REFRACTORY MATERIAL.—J. G. Stein and Co., Ltd., and J. F. Hyslop. 25872, 25873.

CLEANING POWDERS.—U. C. Tainton. 25631.

PRODUCTION OF ANTISEPTICS, ETC.—E. Timmermann. 25720.

TREATMENT OF RUBBER.—United States Rubber Products, Inc. (United States, Sept. 11, '37.) 26008, 26009, 26010.

TREATMENT OF MINERALS CONTAINING IRON.—I. de Vecchis. 25605.

AFTER-TREATING VISCOSE ARTIFICIAL SILK.—Vereinigte Glanzstoff-Fabriken A.-G. (Germany, Sept. 14, '37.) 26019.

CELLULOSE FROM PURE STRAW.—I. Zimmt. 25615.

PRODUCTION OF OXALIC ACID by the oxidation of carbohydrates with nitric acid.—Zjednoczone Fabryki Zwiazkon Azotowych W. Mosciach. (Poland, Sept. 8, '37.) 25898.

Complete Specifications Open to Public Inspection

COMPOSITIONS OF MATTER CONTAINING ANTI-HYGROSCOPIC AGENTS and processes of preparing the same.—Armour and Co. March, 1, 1937. 27345/37.

USE OF CHROMIUM-NICKEL ALLOYS.—Heraeous-Vacuumschmelze, A.-G.—March 4, 1937. 2402/38.

MANUFACTURE FROM PLASTIC MATERIALS OF OBJECTS having a metallic appearance.—Soc. Des Usines Chimiques Rhone-Poulenc. March 3, 1937. 5418/38.

PREPARATION OF SIZE COMPOSITIONS containing salts of cellulose ether carboxylic acids as their essential constituent.—F. Sichel, A.-G. March 1, 1937. 5584/38.

ACID BATHS employed in metallurgy.—R. J. Kahn. March 4, 1937. 6189/38.

PREPARATION OF SULPHONATED ORGANIC MATERIALS.—National Oil Products Co., Inc. March 2, 1937. 6395/38.

PRODUCTION OF FAST DYEINGS AND PRINTINGS by means of ester salts of leuco vat-dyestuffs.—Durand and Huguenin, A.-G. March 1, 1937. 6408/38.

PROCESS FOR THE MANUFACTURE OF ALCOHOLS of the cyclopentanopolyhydrophenanthrene series.—Schering, A.-G. March 1, 1937. 6459/38.

METHOD OF PRODUCING ENAMEL, more particularly white-clouded iron enamel.—L. Kreidl. March 4, 1937. 6537/38.

MANUFACTURE OF POLYMETHINE DYESTUFFS.—I. G. Farbenindustrie. March 4, 1937. 6560/38.

PROCESS FOR THE MANUFACTURE OF HIGHLY CONCENTRATED AQUEOUS SOLUTIONS of germ-gland hormones and their derivatives.—Schering, A.-G. March 2, 1937. 6582/38.

MANUFACTURE OF POLYMERISATION PRODUCTS OF BUTADINES-1 : 3.—I. G. Farbenindustrie. March 2, 1937. 6584/38.

BONDING OLEFINE POLYSULPHIDE PLASTICS TO FLEXIBLE BASES.—United States Rubber Products, Inc. March 4, 1937. 6636/38.

EXPLOSIVES.—American Cyanamid Co. March 4, 1937. 6693/38.

MANUFACTURE OF DYESTUFFS OR DYESTUFF INTERMEDIATES and of photographic silver-halide emulsions.—I. G. Farbenindustrie. March 3, 1937. 6700/38.

MANUFACTURE AND PRODUCTION OF ARTIFICIAL RUBBER-LIKE SUBSTANCES.—I. G. Farbenindustrie. March 4, 1937. 6709/38.

METHOD OF REFINING SELENIUM.—Standard Telephones and Cables, Ltd. March 4, 1937. 6846/38.

PYLOLIPASES POOR IN TOXIC ALBUMINS and methods of producing the same. A. Karreth. March 4, 1937. 6859/38.

PROCESS FOR THE MANUFACTURE OF TITANIC ACID ESTERS.—I. G. Farbenindustrie. March 4, 1937. 6898./38.

PROCESS FOR THE MANUFACTURE OF ARTIFICIAL SILICA STONES.—R. T. Nagybatony-Ujlaki Egyesult Iparmuvek,. March 5, 1937. 7134/38.

PROCESS FOR THE MANUFACTURE OF DERIVATIVES OF STEROLS.—Schering, A.-G. March 5, 1937.—7145/38.

MANUFACTURE OF RESINS.—Kodak, Ltd. March 5, 1937. 7159/38.

Specifications Accepted with Dates of Application

CELLULOSE ETHERS and shaped structures made therefrom.—L. Lilienfeld. Dec. 2, 1936. 491,488.

MANUFACTURING RUBBER-LIKE MATERIALS.—E. E. Towler (Kabushiki Kaisha Sumitomo Densen Seizosho). Nov. 27, 1936. (Sample furnished.) (Convention date not granted.) 491,309.

MANUFACTURE OF STEEL.—W. E. Woodward, W. G. Allen and Sons (Tipton), Ltd., and S. Osborn & Co., Ltd. Nov. 30, 1936. 491,311.

PRODUCTION OF LOW BURNING OILS from higher-boiling oils.—H. E. Girling (legal representative of H. D. Elkington (deceased)) (Gewerkschaft Handel und Industrie). Dec. 28, 1936. (Convention date not granted.) 491,312.

ANTHRAQUINONE COMPOUNDS.—S. Coffey, N. H. Haddock, C. Wood, and Imperial Chemical Industries, Ltd Feb. 1, 1937. 491,493.

PRODUCTION OF HYDROCARBON GASES by hydrogenation of carbonaceous materials.—Institution of Gas Engineers, and F. J. Dent. Feb. 2, 1937. 491,453.

RUBBER and the like processes and products.—T. L. Shepherd. Jan. 28, 1937. 491,374.

SOAP and process of and apparatus for producing soap.—Refining, Inc. Jan. 29, 1936. 491,315.

COATING and/or impregnating of paper and like materials.—E. I. Du Pont de Nemours and Co., J. K. Hunt, and G. H. Latham. Feb. 25, 1937. 491,317.

MANUFACTURE OF RESINOUS CONDENSATION PRODUCTS.—W. W. Groves (I. G. Farbenindustrie). March 1, 1937. (Convention date not granted.) 491,449.

MANUFACTURE AND PRODUCTION OF AZO DYESTUFFS.—G. W. Johnson (I. G. Farbenindustrie). March 1, 1937. (Sample furnished.) 491,496.

MANUFACTURE OF PRODUCTS CONTAINING NITROGEN AND SULPHUR and their application in the textile industry.—W. W. Groves (I. G. Farbenindustrie). March 3, 1937. 491,565.

ENZYMATIC PREPARATIONS.—Rohm and Haas, A.-G. March 5, 1936. 491,515.

PRODUCTION OF AQUEOUS SOLUTIONS OF PHENOLS which are difficultly soluble in water.—F. Koenigsberger. March 3, 1937. 491,567.

MANUFACTURE AND PRODUCTION OF ACETYLENE.—G. W. Johnson (I. G. Farbenindustrie). March 3, 1937. 491,568.

DRYING OIL COMPOSITIONS.—Bakelite, Ltd. April 25, 1936. 491,519.

MANUFACTURE OF SYNTHETIC LUBRICATING OILS.—A. P. Lowes, and Imperial Chemical Industries, Ltd. March 4, 1937. 491,522.

PROCESS FOR THE MANUFACTURE OF VAT DYESTUFFS.—I. G. Farbenindustrie. March 4, 1936. 491,525.

RECOVERY OF PHENOLS FROM OILS.—G. W. Johnson (I. G. Farbenindustrie). March 4, 1937. 491,320.

MANUFACTURE OF DI-(γ-CHLORO-*α*- *or* *β*-OXYPROPYL)-ARYLAMINES.—I. G. Farbenindustrie. April 18, 1936. 491,527.

PRODUCTION OF ALLOYS.—P. Huntzicker. March 5, 1937. 491,528.

PRODUCTION OF CITRIC ACID.—Chauncey Chemical Corporation. March 20, 1936. 491,534.

MAGNETIC MATERIALS.—J. L. McCowen, and Imperial Chemical Industries, Ltd. March 5, 1937. 491,537.

PRODUCTION OF TITANIUM DIOXIDE and products containing the same.—Naamlooze Vennootschap Industrieele Maatschappij Voorheen Noury and Van Der Lande. March 7, 1936. 491,541.

MANUFACTURE OF REACTION PRODUCTS of alkylated aromatic hydroxy compounds, and compositions containing the products.—Socony-Vacuum Oil Co., Inc. March 12, 1936. 491,323.

PRODUCTION OF VALUABLE HYDROCARBON PRODUCTS by the destructive hydrogenation of extraction products of solid carbonaceous materials.—H. E. Potts. March 20, 1937. 491,543.

MANUFACTURE of diazo-compounds of 2-amino-1-oxynaphthalene sulphonic acids containing nitro-groups.—Soc. of Chemical Industry in Basle. May 14, 1936. 491,398.

REGENERATION OF USED BLEACHING CLAYS AND EARTHS.—G. Stalmann, and Noblee and Thorl Ges. June 9, 1937. 491,338.

MANUFACTURE OF POLYAZO-DYESTUFFS.—Soc. of Chemical Industry in Basle. June 17, 1936. (Samples furnished.) 491,551.

MANUFACTURE OF COMPOUNDS of therapeutic value.—Wellcome Foundation, Ltd., T. A. Henry, and W. H. Gray. June 24, 1937. 491,265.

BENZYL-OXYALKYL AROMATIC SULPONATES, and method of preparation.—Mellon Institute of Industrial Research. April 26, 1937. 491,349.

MANUFACTURE OF BENZYL-OXALKYL AND HYDROXYALKYL ETHERS OF CINCHONA ALKALOIDS.—Mellon Institute of Industrial Research. April 26, 1937. 491,351.

SEPARATION BY FLOTATION of ammonium chloride from its mixtures with alkali metal salts.—Soc. D'Etudes Pour La Fabrication et L'Emploi Des Engrais Chimiques. October 28, 1936. 491,472.

APPARATUS FOR THE PRODUCTION OF CARBON DISULPHIDE.—I. G. Farbenindustrie. Oct. 19, 1936. 491,402.

CONVERSION OF HYDROCARBON OILS.—A. L. Mond (Universal Oil Products Co.). Nov. 16, 1937. 491,411.

PREPARATION OF ALKALI-RESISTANT COATING COMPOSITIONS.—Beck, Koller, and Co. (England), Ltd. Dec. 17, 1936. 491,418.

MANUFACTURE OF BITUMINOUS MIXTURES used in road-making.—H. Moll, and K. H. Matthias. Jan. 15, 1938. 491,362.

METHOD OF MANUFACTURING RUBBER-LIKE MATERIALS.—E. E. Towler (Kabushiki Kaisha Sumitomo Densen Seizosho). Nov. 27, 1936. (Convention date not granted.) 491,363.

REMOVING ORGANIC SULPHUR COMPOUNDS from fule gases previously freed of hydrogen sulphide.—A. A. Thornton (Kohle und Eisenforschung Ges.). Feb. 19, 1938. 491,299.

RENDERING MATERIALS MOTH-PROOF, and materials treated thereby.—J. R. Geigy, A.-G. March 12, 1937. (Addition to 484,448). 491,434.

MANUFACTURE OF FIXER ETHERS.—Standard Alcohol Co. Jan. 22, 1937. 491,441.

Books Received

Thorpe's Dictionary of Applied Chemistry. By. J. F. Thorpe and M. A. Whiteley. 4th edition. Vol. II. London: Longmans' Green & Co. Pp. 711. 63s.

Weekly Prices of British Chemical Products

THERE has been a steady although a somewhat subdued demand for general chemicals during the past week the market being influenced by the European political situation. Trade has almost been wholly confined to small parcels to meet spot or nearby requirements, there being little or no interest in fresh contract business. Apart from the recent reduction in the quotations for distilled glycerine there have been no important price changes for industrial chemicals and values continue steady. Trade in the market for coal tar products continues to be of a restricted character with buyers holding off the market. No further weakness has developed in any direction and values on the whole are steady.

Price Changes

Rises: Benzol, standard motor; 90%; pure.

Falls: Naphthalene, refined (Manchester); Calcium Acetate, grey (Manchester).

MANCHESTER.—The Manchester market for chemical products during the past week has been in a nervous state in consequence of the international unsettlement, and buying generally has been on a cautious scale. Sellers have reported a relatively small number of contract additions to order books, but the bulk of the very moderate business placed has related to small early delivery parcels. The price position in respect of most descriptions of heavy chemicals is steady and few important changes have occurred. With regard to the tar products, the crude tars and benzols have probably been the most active sections, though a slight increase in inquiry for toluol has also been in evidence during the past few days.

General Chemicals

ACETONE.—**£45 to £47 per ton.**

ACETIC ACID.—**Tech, 80%, £30 5s. per ton; pure 80%, £32 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.**

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 2s. 6d. per ton d/d Lancs. GLASGOW: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders. SCOTLAND: 10½d. to 1s. 0½d., containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—Grey, £18 10s. per ton, d/d U.K. Fine white, 98%, £17 per ton, d/d U.K.

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM DICHROMATE.—8½d. per lb. d/d U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £11 per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. MANCHESTER: White powdered Cornish, £16 10s. per ton, ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £11 10s. per ton.

BLEACHING POWDER.—Spot, 35/37%, £9 5s. per ton in casks, special terms for contracts. SCOTLAND: £9 per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16, crystal, £17; powdered, £17 10s. per ton in 1-cwt. bags, carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHLORINE, LIQUID.—£18 15s. per ton, seller's tank wagons, carriage paid to buyer's sidings; £19 5s. per ton, d/d in 16/17 cwt. drums (3-drum lots); £19 10s. per ton d/d in 10-cwt. drums (4-drum lots); 3½d. per lb. d/d station in 70-lb. cylinders (1-ton lots).

CHROMETAN.—Crystals, 2¾d. per lb.; liquor, £13 per ton d/d station in drums. GLASGOW: 70/75% solid, £5 15s. per ton net ex store.

CHROMIC ACID.—10d. per lb., less 2½%; d/d U.K.

CHROMIC OXIDE.—11d. per lb.; d/d U.K.

CITRIC ACID.—1s. 0¼d. per lb. MANCHESTER: 1s. 0¼d. SCOTLAND: B.P. crystals, 1s. 0¼d. per lb.; less 5%, ex store.

COPPER SULPHATE.—£18 5s. per ton, less 2% in casks. MANCHESTER: £18 10s. per ton f.o.b. SCOTLAND: £18 15s. per ton, less 5%, Liverpool, in casks.

CREAM OF TARTAR.—100%, 92s. per cwt., less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£20-£22 per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—**Chemically pure, double distilled, 1.260 s.g., in tins, £3 17s. 6d. to £4 17s. 6d. per cwt. according to quantity; in drums, £3 10s. 0d. to £4 2s. 6d.**

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 6s. 9d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots). Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One-ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. GLASGOW: White crystals, £30; brown, £1 per ton less. MANCHESTER: White, £31; brown, £30.

LEAD, NITRATE.—£32 per ton for 1-ton lots.

LEAD, RED.—£30 15s. 0d. 10 cwt. to 1 ton, less 2½% carriage paid. SCOTLAND: £30 per ton, less 2¼% carriage paid for 2-ton lots.

LITHARGE.—SCOTLAND: Ground, £30 per ton, less 2½%, carriage paid for 2-ton lots.

MAGNESITE.—Calcined, in bags, ex works, about £8 per ton. SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—Solid (ex wharf) £5 10s. per ton. SCOTLAND: £7 5s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY.—**Ammoniated B.P. (white precip.), lump, 5s. 10d. per lb.; powder B.P., 6s. 0d.; bichloride B.P. (corros. sub.) 5s. 1d.; powder B.P. 4s. 9d.; chloride B.P. (calomel), 5s. 10d.; red oxide cryst. (red precip.), 6s. 11d.; levig. 6s. 5d.; yellow oxide B.P. 6s. 3d.; persulphate white B.P.C., 6s. 0d.; sulphide black (hyd. sulph. cum sulph. 50%), 5s. 11d. For quantities under 112 lb., 1d. extra; under 28 lb., 5d. extra.**

METHYLATED SPIRIT.—**61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.**

NITRIC ACID.—Spot, £25 to £30 per ton according to strength, quantity and destination.

OXALIC ACID.—**£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £55 per ton ex store.**

PARAFFIN WAX.—**SCOTLAND: 3¾d. per lb.**

POTASH CAUSTIC.—Solid, £35 5s to £40 per ton according to quantity, ex store; broken, £42 per ton. MANCHESTER: £38.

POTASSIUM CHLORATE.—**£36 7s. 6d. per ton. GLASGOW: 4¼d. per lb. MANCHESTER: £37 per ton.**

POTASSIUM DICHROMATE.—**5¼d. per lb. carriage paid. SCOTLAND: 5¼d. per lb., net, carriage paid.**

POTASSIUM IODIDE.—**B.P. 6s. 3d. per lb. in 7 lb. lots.**

POTASSIUM NITRATE.—**Small granular crystals, £24 to £27 per ton ex store, according to quantity. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.**

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. Crystals, 9¾d. MANCHESTER: B.P. 10½d. to 11½d.

POTASSIUM PRUSSIATE.—**6½d. per lb. SCOTLAND: 6¾d. net, in casks, ex store. MANCHESTER: Yellow, 6½d. to 6¾d.**

PRUSSIATE OF POTASH CRYSTALS.—**In casks, 6¾d. per lb. net, ex store**

SALAMMONIAC.—**Firsts lump, spot, £42 17s. 6d. per ton, d/d address in barrels Dog-tooth crystals, £36 per ton; fine white crystals, £18 per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.**

SALT CAKE.—Unground, spot, £3 11s. per ton.
SODA ASH.—58% spot, £5 17s. 6d. per ton f.o.r. in bags.
SODA, CAUSTIC.—Solid, 76/77° spot, 13s. 10s. per ton d/d station. SCOTLAND: Powdered 98/99%, £18 10s. in drums, £19 5s. in casks, Solid 76/77° £15 12s. 6d. in drums; 70/73%, £15 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts, 10s. per ton less.
SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.
SODIUM ACETATE.—£19-£20 per ton carriage paid North. GLASGOW: £18 10s. per ton net ex store.
SODIUM BICARBONATE.—Refined spot, £10 15s. per ton d/d station in bags. GLASGOW: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags. MANCHESTER: £10 15s.
SODIUM BISULPHITE POWDER.—60/62%, £14 10s. per ton d/d in 2-ton lots for home trade.
SODIUM CARBONATE MONOHYDRATE.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.
SODIUM CHLORATE.—£27 10s. to £32 per ton. GLASGOW: £1 11s. per cwt., minimum 3 cwt. lots.
SODIUM DICHROMATE.—Crystals cake and powder 4½d. per lb. net d/d U.K. with rebates for contracts.
SODIUM CHROMATE.—4½d. per lb. d/d U.K.
4d. per lb. GLASGOW: 4½d. net, carriage paid.
SODIUM HYPOSULPHITE.—Pea crystals, £15 5s. per ton for 2-ton lots; commercial, £11 5s. per ton. MANCHESTER: Commercial, £11; photographic, £15 10s.
SODIUM METASILICATE.—£14 5s. per ton, d/d U.K. in cwt. bags.
SODIUM NITRATE.—Refined, £8 per ton for 6-ton lots d/d. GLASGOW: £1 12s. 0d. per cwt. in 1-cwt. kegs, net, ex store.
SODIUM NITRITE.—£18 5s. per ton for ton lots.
SODIUM PERBORATE.—10%, 9½d. per lb. d/d in 1-cwt. drums.
SODIUM PHOSPHATE.—Di-sodium, £12 per ton delivered for ton lots. Tri-sodium, £16 10s. per ton delivered per ton lots.
SODIUM PRUSSIATE.—d. per lb. for ton lots. GLASGOW: 5d. to 5¾d. ex store. MANCHESTER: 4¼d. to 5¼d.
SODIUM SILICATE.—£8 2s. 6d. per ton.
SODIUM SULPHATE (GLAUBER SALTS).—£3 per ton d/d.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 12s. 6d.
SODIUM SULPHIDE.—Solid 60/62%, Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 10s.
SODIUM SULPHITE.—Pea crystals, spot, £14 10s. per ton d/d station in kegs.
SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.
SULPHURIC ACID.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.
TARTARIC ACID.—1s. 1¼d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 1¼d. per lb. GLASGOW: 1s. 1d. per lb., 5%, ex store.
ZINC SULPHATE.—Tech., £11 10s. f.o.r., in 2 cwt. bags.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 7d. to 1s. 2d. per lb., according to quality. Crimson, 1s. 6d. to 1s. 7½d. per lb.
ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.
BARYTES.—£6 to £6 10s. per ton, according to quality.
CADMIUM SULPHIDE.—3s. 9d. to 4s. per lb.
CARBON BLACK.—3¼d. to 3 15/16d. per lb., ex store.
CARBON DISULPHIDE.—£31 to £33 per ton, according to quantity, drums extra.
CARBON TETRACHLORIDE.—£41 to £46 per ton, according to quantity, drums extra.
CHROMIUM OXIDE.—Green, 10¼d. to 11d. per lb.
DIPHENYLGUANIDINE.—2s. 2d. per lb.
INDIA-RUBBER SUBSTITUTES.—White, 4¾d. to 5¼d. per lb.; dark 3¾d. to 4¼d. per lb.
LAMP BLACK.—£24 to £26 per ton del., according to quantity. Vegetable black, £35 per ton upwards.
LEAD HYPOSULPHITE.—9d. per lb.
LITHOPONE.—Spot, 30%, £16 10s. per ton, 2-ton lots d/d in bags.
SULPHUR.—£9 to £9 5s. per ton. SULPHUR PRECIP. B.P., £55 to £60 per ton. SULPHUR PRECIP. COMM., £50 to £55 per ton.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quantity.
VERMILION.—Pale, or deep, 4s. 9d. per lb., 1-cwt. lots.
ZINC SULPHIDE.—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

Nitrogen Fertilisers

AMMONIUM SULPHATE.—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1938: November, £7 8s.; December, £7 9s. 6d.; January, 1938, £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.
CALCIUM CYANAMIDE.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1938: November, £7 10s.; December, £7 11s. 3d.; January, 1938, £7 12s. 6d.; February, £7 13s. 9d.; March, £7 15s.; April/June, £7 16s. 3d.
NITRO CHALK.—£7 10s. 6d. per ton up to June 30, 1938.
SODIUM NITRATE.—£8 per ton for delivery up to June 30, 1938.
CONCENTRATED COMPLETE FERTILISERS.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.
AMMONIUM PHOSPHATE FERTILISERS.—£10 19s. 6d. to £14 16s. 6d per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3¼d. to 1s. 4d., 90%, 1s. 4½d. to 1s. 5d., pure, 1s. 8½d. to 1s. 9d. GLASGOW: Crude, 10d. to 10½d. per gal.; motor, 1s. 4d. to 1s. 4½d. MANCHESTER: Pure, 1s. 8d. per gal.; crude, 11⅞d. to 1s. per gal.
CARBOLIC ACID.—Crystals, 7½d. to 8½d. per lb., small quantities would be dearer; Crude, 60's, 1s. 10½d. to 2s. 1½d.; dehydrated, 2s. 6d. per gal., according to specification; Pale, 99/100%, per lb. f.o.b. in drums; crude, 2s. 1d. per gal.
CREOSOTE.—Home trade, 4½d. per gal., f.o.r. makers' works; exports 6⅝d. to 6⅝d. per gal., according to grade. MANCHESTER: 4¼d. to 5d. GLASGOW: B.S.I. Specification, 6d to 6½d. per gal.; washed oil, 5d. to 5½d.; lower sp. gr oils 5¾d. to 6½d.
CRESYLIC ACID.—97/99%, 1s. 9d. to 2s.; 99/100%, 2s. 6d. to 3s. 6d. per gal., according to specification; Pale, 99/100%, 2s. 1d. to 2s. 3d.; Dark, 95%, 1s. 7d. to 1s. 8d. per gal. GLASGOW: Pale, 99/100%, 5s. to 5s. 6d. per gal.; pale, 97/99%, 4s. 6d. to 4s. 10d., dark, 97/99%, 4s. 3d. to 4s. 6d.; high boiling acids, 2s. to 2s. 6d. American specification. 3s. 9d. to 4s. MANCHESTER: Pale, 99/100%, 2s.
NAPHTHA.—Solvent, 90/160, 1s. 6d. to 1s. 7d. per gal.; solvent, 95/160%, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190%, 1s. 1d. to 1s. 3d. per gal., naked at works, according to quantity GLASGOW: Crude, 6½d. to 7¼d. per gal.; 90%, 160, 1s. 5d. to 1s. 6d., 90%, 190, 1s. 1d. to 1s. 3d
NAPHTHALENE.—Crude, whizzed or hot pressed, £5 to £6 per ton; purified crystals, £11 10s. per ton in 2-cwt. bags. LONDON: Fire lighter quality, £3 to £4 10s. per ton. GLASGOW: Fire lighter, crude, £6 to £7 per ton (bags free) MANCHESTER: Refined, £13 to £14 per ton, f.o.b.
PITCH.—Medium, soft, 33s. per ton, f.o.b. MANCHESTER: 31s. 6d. f.o.b., East Coast. GLASGOW: f.o.b. Glasgow, 35s. to 37s. per ton; in bulk for home trade, 35s.
PYRIDINE.—90/140%, 11s. 6d. to 13s. 6d. per gal.; 90/160%, 9s. 6d. to 10s. 9d. per gal.; 90/180%, 2s. 6d. to 3s. 6d. per gal. f.o.b. GLASGOW: 90% 140, 10s. to 12s. per gal.; 90% 160, 9s. to 10s.; 90% 180, 2s. 6d. to 3s. MANCHESTER: 8s. to 9s. 6d. per gallon.
TOLUOL.—90%, 1s. 10d. per gal.; pure 2s. 2d. GLASGOW: 90% 120, 1s. 10d. to 2s. 1d. per gal.
XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 3d. to 2s 3½d. GLASGOW: Commercial, 2s. to 2s. 1d. per gal.

Wood Distillation Products

CALCIUM ACETATE.—Brown, £6 15s. to £9 5s. per ton; grey, £8 15s. to £9 5s. MANCHESTER: Brown, £8 10s.; grey, £9 15s.
METHYL ACETONE.—40.50%, £36 to £38 per ton.
WOOD CREOSOTE.—Unrefined, 4d. to 6d. per gal., according to boiling range.
WOOD NAPHTHA, MISCIBLE.—2s. 8d. to 3s. per gal.; solvent, 3s. 3d. to 3s. 6d. per gal.
WOOD TAR.—£2 to £8 per ton, according to quality.

Intermediates and Dyes

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZIDINE, HCl.—2s. 7½d. per lb., 100% as base, in casks.
BENZOIC ACID, 1914 B.P. (ex toluol).—1s. 11½d. per lb. d/d buyer's works.
m-CRESOL 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.
o-CRESOL 30/31° C.—6½d. to 7½d. per lb. in 1-ton lots.
p-CRESOL, 34·5° C.—1s. 7d. to 1s. 8d. per lb. in ton lots.
DICHLORANILINE.—2s. 1½d. to 2s. 5½d. per lb.
DIMETHYLANILINE.—Spot, 1s. 7½d. per lb., package extra.
DINITROBENZENE.—8d. per lb.
DINITROCHLORBENZENE, SOLID.—£79 5s. per ton.
DINITROTOLUENE.—48/50° C., 9½d. per lb.; 66/68° C., 11d.
DIPHENYLAMINE.—Spot, 2s. 2d. per lb., d/d buyer's works.
GAMMA ACID, Spot, 4s. 4½d. per lb. 100% d/d buyer's works.
H ACID.—Spot, 2s. 7d. per lb.; 100% d/d buyer's works.
NAPHTHIONIC ACID.—1s. 10d. per lb.
β-NAPHTHOL.—£97 per ton; flake, £94 8s. per ton.
α-NAPHTHYLAMINE.—Lumps, 1s. 1d. per lb.
β-NAPHTHYLAMINE.—Spot, 3s. per lb.; d/d buyer's works.
NEVILLE AND WINTHER'S ACID.—Spot, 3s. 3½d. per lb. 100%.
o-NITRANILINE.—4s. 3½d per lb.
m-NITRANILINE.—Spot, 2s. 10d. per lb. d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 10d. to 2s. 3½d. per lb. d/d buyer's works.
NITROBENZENE.—Spot, 4½d. to 4¾d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.
NITRONAPHTHALENE.—10½d. per lb.; P.G., 1s. 0½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.
SULPHANILIC ACID.—Spot, 8¾d. per lb. 100%, d/d buyer's works
o-TOLUIDINE.—11d. per lb., in 8/10 cwt. drums, drums extra.
p-TOLUIDINE.—1s. 11d. per lb., in casks.
m-XYLIDINE ACETATE.—4s. 8d. per lb., 100%.

Commercial Intelligence

Mortgages and Charges

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

MOULDED RUBBER PRODUCTS, LTD., Enfield. (M., 17/9/38.) September 3, £2,500 debentures balance of £10,000, registered November 22, 1937. *£4,250. December 17, 1937.

Satisfactions

BENZOL AND BY-PRODUCTS, LTD., London, E.C. (M.S., 17/9/38.) Satisfactions September 5, £18,000, registered June 9, 1937, and of £22,000 debenture registered June 9, 1937, to the extent of £12,000.

County Court Judgments

TRAVIS, S. H., and Co. (sued as a firm), 30 Kings Road, N.W.11, manufacturing chemist. (C.C., 17/9/38.) £20 14s. 2d. July 27.

Declarations of Solvency Filed

EDWIN TODD, LTD., Nottingham, paint manufacturers. (D.S.F., 17/9/38.) September 2.

GAVIN EGERTON, LTD., Rhyl, paint manufacturers. (D.S.F., 17/9/38.) September 2.

Receiverships

BERGER (PARIS) PRODUCTS, LTD., manufacturers of disinfectant, etc., 22 Basinghall Street, E.C. C. H. Culpin, 15 Old Fort Road, Shoreham-by-Sea, Sussex, has been appointed receiver and manager, on September 1, 1938, under powers contained in instrument dated September 12, 1935.

Forthcoming Events

London.

September 16-October 1.—The Building Exhibition, Olympia.
September 19-23.—Chemists' Exhibition, Royal Albert Hall, Kensington, S.W.7.

Glasgow.

September 16-20.—The Society of Chemical Industry. Special Autumn Meeting.

Oxford.

September 21-26.—International Conference for Documentation. Lady Margaret Hall.

Company News

Imperial Smelting Corporation announces a dividend of 1¼ per cent. on 6½ per cent. cumulative preference shares, payable October 1, subject to no deduction for U.K. tax, as rate of relief to be granted in respect of Dominion income-tax is equivalent to full standard rate of U.K. income-tax of 5s. 6d. in the £.

United Turkey Red Co., have decided not to pay the dividend due this month on the 4 per cent. first cumulative preference shares of the company. The report for the half-year ended June 30 last again showed a loss on trading. Dividends on the 5½ per cent. second preference shares are in arrear from December 31, 1933, and the last payment on the ordinary shares was 6 per cent. for 1929.

Thorncliffe Coal Distillation reports a profit of £76,193 for the year ended June 30 last, which compares with £68,648 for the preceding year, a rise of £7,545. Both figures are struck after providing for depreciation and tax. As previously announced, the year's dividend is again 75 per cent., less tax, and after placing £30,000 to reserve, £19,300 goes forward. Last year £20,000 was transferred to reserve for plant, replacements, etc., and £27,974 was taken forward.

International Nickel Company of Canada announce a regular dividend on preferred of $1.75, payable November 1 to shareholders registered October 4.

New Companies Registered

M.O. Laboratory, Ltd. 344,218.—Private company. Capital £500 in £1 shares. To carry on the business of examiners and analysers of substances of liquids; analysts, and to undertake all chemical, biochemical and physiological investigations and research work of any kind. Directors: Reginald Milton, B.Sc., 16 Lichfield Road, Northwood Hills, Middlesex; David Gubbay. Registered office: First Avenue House, High Holborn, W.C.1.

R. G. Harbott and Co. 344,223.—Private company. Capital £2,000 in 12,000 "A" shares of 1s. and 1,400 "B" shares of £1 each. To acquire the business of manufacuring chemists, etc., heretofore carried on by Reuben G. Rutter-Harbott and Arthur R. Cox, at 242 Sebert Road, Forest Gate, E., as "R. G. Harbott & Co." Directors: Reuben G. Rutter-Harbott, 61 Dangan Road, Wanstead; Arthur R. Cox.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

New Zealand.—A well-established firm of agents at Auckland wishes to obtain the representation, mainly on a purchasing basis, of United Kingdom manufacturers of proprietary medicines and toilet preparations for New Zealand. (Ref. No. 180.)

Palestine.—A firm in Jerusalem wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of educational and laboratory supplies. (Ref. No. 181.)

Switzerland.—A well-established firm of manufacturers, merchants and agents at Goldach, Switzerland, wishes to obtain the representation, on a commission and/or purchasing basis, of United Kingdom manufacturers of cosmetics and pharmaceutical products and raw materials for the manufacture of such products for Switzerland. (Ref. No. 189.)

Chemical and Allied Stocks and Shares

THE increased tension in European political affairs which developed this week has led to a further marking down of values in all sections of the Stock Exchange. This was largely a precautionary measure because of the possibility that heavy selling might develop. Nevertheless, the amount of liquidation was not particularly heavy, although at times market conditions were more or less nominal owing to the absence of buyers.

At the time of writing shares of companies connected with the chemical and allied trades, although lower on balance, have not declined very heavily in price. Turner and Newall, however, have been marked down from 78s. to 73s., and Imperial Chemical are 29s. 6d., compared with 31s. a week ago, while British Oxygen have gone back from 68s. 9d. to 67s. 6d. Tube Investments were also reactionary with a decline to 77s. 6d.

British Aluminium were steady at 48s. 9d., and at the time of writing Boots Pure Drug are little changed at 39s. 6d. Sangers at 22s. 4½d. have been fairly well maintained and Timothy Whites and Taylors and British Drug Houses were also little changed, but, as in many other cases this week, it is doubtful if prices were tested adequately by dealings. United Glass Bottle ordinary shares moved down from 47s. 6d. to 46s. 3d., but Triplex Glass were steadier after a sharp decline. B. Laporte were again around 86s., and Fison Packard and Prentice at 34s. 9d. had a steady appearance, awaiting the dividend announcements.

Associated Portland Cement have reacted to 76s., but this was due to the general trend; the market remains hopeful; the interim dividend will be unchanged. Pinchin Johnson were marked down to 26s. 3d., and International Paint to 68s. 9d. British Plaster Board were lower at 25s. 5d. Murex have gone back to 75s., but were steadier subsequently, sentiment being influenced by current dividend estimates. Tecalemit ordinary shares have attracted some attention owing to talk of an increase in the forthcoming dividend payment, but, as in other directions, the shares are lower as compared with a week ago.

United Steel at 22s. 3d. were little changed, awaiting declaration of the final dividend. Colvilles, Dorman Long and most other iron and steel shares were lower, despite reports of rather more active conditions in the heavy industries. Hadfields and other shares of companies with important armament interests were also unable to move against the general trend of markets.

Securities with an international market declined very heavily earlier in the week, including leading oil shares, such as "Shell" and Royal Dutch, but later the tendency was less uncertain and Anglo-Iranian and Trinidad Leaseholds showed moderate improvement. International Nickel, Swedish Match and Lever Bros. ordinary have been subject to selling from Paris.